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THE

NEW POPULAR EDUCATOR

A Complete Encyclopædia

OF

ELEMENTARY AND ADVANCED EDUCATION.

VOL. VIII.

CASSELL & COMPANY, LIMITED:
LONDON, PARIS & MELBOURNE.

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1892.

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CASSELL'S
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ENGLISH LITERATURE.—XII.

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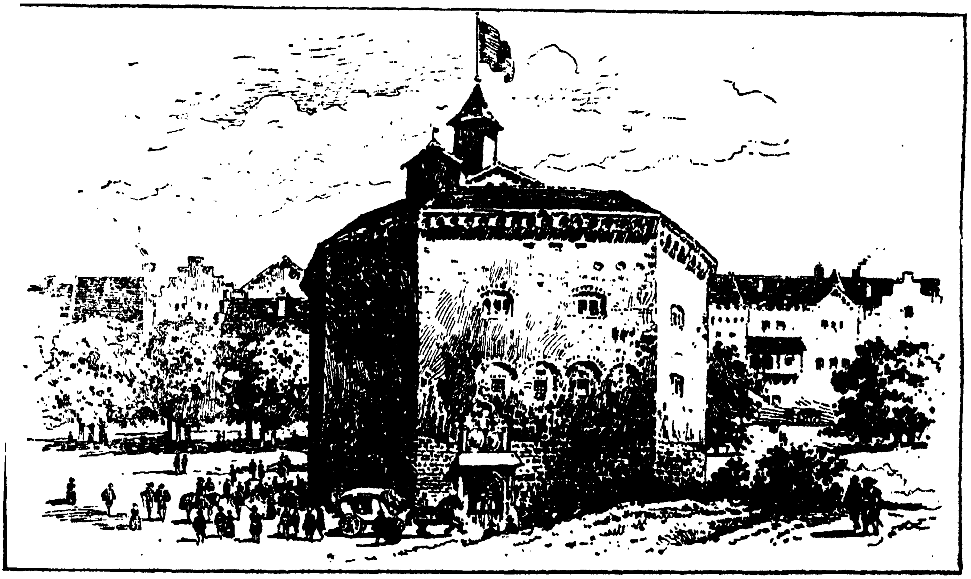


THE GLOBE THEATRE.
(*After an Engraving in Crace's "Ancient and Modern Views of London."*)

THE ELIZABETHAN PERIOD: THE DRAMATISTS.

BEN JONSON.

NEXT to Shakespeare in point of time among the greater Elizabethan dramatists, and next to him, perhaps, in genius, stands Jonson, always called by himself and his contemporaries, as well as by posterity, by the abbreviated title, Ben Jonson. He was born in London, near Charing Cross, in 1573. His family had a generation earlier been in prosperous circumstances, but he was born to great poverty. He was the posthumous son of a clergyman; but his mother married for her second husband a bricklayer, and Jonson in early youth was obliged to follow the employment of his stepfather. Through the kindness of William Camden, however, he was enabled to become a scholar at Westminster School. He afterwards served for some time as a soldier in the Low Countries. But while still young, like many another young man of his day, whose tastes and aspirations were above his fortune, he turned actor. From acting he advanced, as others did, to dramatic writing; and down to the time of his death, in 1637, his diligence as a play-writer was unceasing. Singularly unfavourable as the circumstances of his early life were for learning, Jonson's love of knowledge triumphed over them. His reading was wide and accurate, his acquaintance with classical authors very minute. He was beyond doubt one of the most learned men of a learned age.

Jonson had written several plays—some perhaps of those still in existence being among the number—but they had all proved failures, when in 1596 the comedy of *Every Man in his Humour* was brought out at the Globe Theatre, and its success was so great as at once to establish its author's position in the very front rank of the dramatists. The reputation thus established Jonson continually increased, nor was it only as a dramatist that he was distinguished. In 1619 he became Poet Laureate, a post to which his poetical merits fully entitled him. And in the brilliant circle of wits and men of letters which became so famous in the Elizabethan period, Jonson's position was supreme.

Jonson's whole career shows us that the leading features of his character were strength of will, indomitable energy, and a proud self-reliance ; and these high qualities were accompanied by a certain roughness and an outspoken freedom both in praise and blame. He certainly did not want the genuine kindness which secures friends, but was deficient in the geniality and tact which avoids or conciliates enemies ; and he was constantly at war with some of his brother dramatists and poets. The very varied incidents of his career, and particularly the fact of his having at one time changed his creed and become a Roman Catholic, and afterwards re-joined the national Church, gave plenty of material for attack. His later days were clouded by poverty and ill-health, and what to a strong and self-reliant nature such as his must have been not less painful than either of these, the consciousness of failing intellectual powers.

Two of Jonson's plays are tragedies—*Sejanus* (1603) and *Catiline* (1611). They are founded upon, and follow with singular fidelity, the authentic and contemporary accounts of the lives and deaths of the two men whose names they bear. The subject in each case was one likely to attract the taste of Ben Jonson. The conspiracy of Catiline and the fall of Sejanus afford ample opportunity for the display of striking dramatic situations. They gave peculiar scope for Jonson's great power of noble and lofty eloquence. They enabled him to use his stores of classical learning ; and the skill with which he has worked into his plays every expression, every hint almost, of the Latin historians and poets, and the completeness in every detail of the picture of Roman manners and customs, are extraordinary. Yet Jonson's tragedies are read, we think, by few people with much pleasure. They are stiff and lifeless, and the characters are unreal. We are interested in the story, the speeches — everything except the men and women themselves. Catiline and Sejanus themselves are both characters purely repulsive. Their fate and their fall excite our wonder, and perhaps a feeling of horror, never our sympathy or pity. Nor is this want of human interest in the principal story balanced by any strong pathos in any of the subsidiary incidents in the play. When Shakespeare made the leading character in his play the base and odious tyrant John, he supplied the missing element of tenderness and pity by introducing the pathetic story of Prince Arthur. In *Sejanus* the one really pathetic incident of the whole play—the murder of the innocent children of Sejanus, and the grief of their broken-hearted mother—forms no part of the action of the play ; it is simply related as a fact in an eloquent but not very appropriate speech, within a few lines of the end of the play.

Of far higher merit than these two tragedies are the comedies of Jonson. These are strongly contrasted in many respects with the comedies of Shakespeare and most of his contemporaries. Jonson's plots are always most carefully and skilfully elaborated. He is never content to follow the usual course of his brother dramatists, and take the story of some Italian novel or earlier play, following the narrative of the original with only such alteration as is absolutely necessary for stage effect. And from this cause Jonson's comedies are peculiarly effective as plays, and carry on the interest of the reader to a remarkable degree. His style is always clear, manly, and vigorous ; it is never vulgar or commonplace, seldom deficient in ease and simplicity, though, as compared with Shakespeare and many others among the dramatists, it has an air of deliberation about it. It is like a noble building erected by art, rather than a tree of spontaneous growth. His extensive learning furnished him with an inexhaustible store of words, phrases, and longer passages from the ancient writers, which he uses in general with admirable judgment. But now and then his learning has betrayed him into a fault. Thus when Knowel, the prudent and matter-of-fact merchant in *Every Man in his Humour*, pours out an eloquent diatribe, borrowed from Juvenal, on the wickedness of the age, and especially on the vices of parents grown the corruptors instead of the protectors of their children, everyone must be struck with the incongruity between this and the whole tone of society depicted in the play, and must feel that however true of Rome in the days of Domitian, it is not true of England in the days of Elizabeth. The morality of Jonson's plays is always pure. He is often coarse in expression; nothing can be much grosser than some of the language and some of the scenes in his best comedies—the *Alchemist*, for instance. But this is merely the coarseness of his times, when men did not hesitate to speak openly of things now left unnamed. He never confuses the boundaries of right and wrong, and therefore is never really immoral.

One characteristic of Jonson's comedies must strike every reader—that though they are comic and humorous always, yet they are, above all, satirical. Except when they are broadly farcical, they are keen satires upon vice, upon hypocrisy, sensuality, avarice. And this—though, perhaps, owing partly to the somewhat severe cast of Jonson's mind—is still more, no doubt, connected with the defect in his dramatic genius to which we have already referred, his inability to produce life-like characters. Those who people Shakespeare's stage are real men and women, with all the ordinary passions of humanity, and strongly marked individuality, though showing also, it may be, the special prominence of one quality or the peculiar characteristics of a class. Jonson has occasionally drawn a character with some life about it, and which has become familiar accordingly, such as Bobadil, the cowardly braggart in *Every Man in his Humour*. But, for the most part, his characters are not much more than mere embodiments of abstract qualities, or mere types of particular classes of society.

The best among Jonson's comedies are *Every Man in his Humour*, the *Alchemist* (1610), the *Silent Woman* (1609), and *Volpone, or the Fox* (1605). The last-mentioned play is a fair sample of Jonson's comedies. It is the story of Volpone, a magnifico of Venice, enormously wealthy, childless, and without an heir, a sensualist, and a cynic. He lives in the enjoyment of every bodily indulgence; but he further allows himself the pleasure of watching the efforts of a number of flatterers, who hang about him, striving for his favour and the chance of succeeding to his wealth; and for this purpose he feigns to be in mortal sickness, trembling on the very brink of the grave. The spirit of the play is expressed at the very beginning, when Volpone soliloquises:—

"What should I do
But cocker up my genius, and live free
To all delights my fortune calls me to?
I have no wife, no parent, child, ally
To give my substance to; but whom I make
Must be my heir; and this makes men observe me:
This draws new clients daily to my house,
Women and men, of every sex and age,
That bring me presents, send me plate, coin, jewels,
With hope that when I die (which they expect
Each greedy minute) it shall then return
Tenfold upon them; whilst some, covetous
Above the rest, seek to engross me whole,
And counterwork the one unto the other,
Contend in fight, as they would seem in loves:

BEN JONSON.
(*From a Picture by Honthorst.*)

All which I suffer, playing with their hopes,
And am content to coin them into profit,
And look upon their kindness, and take more,
And look on that; still bearing them in hand,
Letting the cherry knock against their lips,
And draw it by their mouths, and back again."

The competition in degraded servility between the flatterers; the trick to mislead them of Mosca, Volpone's cunning and ready parasite; the brutal attempts of Volpone to gratify his lusts by violence; the base conspiracy of all these to convict the innocent; and the final exposure and punishment of the guilty, form the subject-matter of the play.

There remains one more class of dramatic compositions of Jonson's which must by no means be overlooked; it is one in which he stands without a rival among dramatists. As Poet Laureate it was a part of his duty to compose a vast number of those masques or entertainments which were so much in vogue at the period. In these entertainments the gentlemen and ladies of the Court, or the members of an inn of court, or other bodies of persons, used to take part. Their plots and the characters represented were borrowed from the classical or the fairy mythology. Sometimes the inhabitants of these very different regions of the imagination met upon the same stage. The pieces were illustrated by elaborate scenery and by appropriate dances. Such pieces afforded the most admirable opportunity for delicate flattery, for the judicious use of Jonson's varied learning, and the exercise of his inexhaustible invention and poetical power.

BEAUMONT AND FLETCHER.

It was a very common practice in the age of which we are writing for two or even more dramatists to combine in producing a single play. Probably these combinations were generally unions not so much of choice as of necessity, and were induced by the exigencies of the managers of the theatres, who sometimes required the plays they had bespoken more quickly than one man could prepare them, or who wished to secure the peculiar skill of different hands for different scenic effects. The partnership of Beaumont and Fletcher was of a very different kind. It was founded upon the warmest friendship, and lasted as long as they both lived.

John Fletcher was born at Rye in 1576. His father was a bishop, and filled successively the sees of Bristol, Winchester, and London. Soon after he was translated to the last-named see he incurred the displeasure of the Queen by a most imprudent, and almost indecent, second marriage, and he was for some time suspended from his bishopric. His promotions, too, with their burdensome incidents of fees, first-fruits, and other expenses, had followed one another with fatal rapidity. The consequence was that he died in embarrassed circumstances, leaving only a very scanty provision for his family. His son, the poet, in all probability, therefore, began life amid the same poverty as most of his brother dramatists. He received, however, a university education at Benet College, Cambridge, and from his works it seems probable that he was a competent, if not a profound, scholar.

Francis Beaumont was born in the year 1586 of an ancient family, which had for some generations been settled in Leicestershire. His father was a judge of the Court of Common Pleas. He himself received his education at Broadgate Hall (now Pembroke College), Oxford, and upon leaving the university became a student of the Inner Temple. He soon, however, abandoned the study of the law and entered upon the more congenial pursuit of literature.

When or how the intimacy of these two men began we cannot tell. Both had certainly appeared as poets, Fletcher very probably as a dramatist, before they began to work in concert. Both were among the younger friends of Ben Jonson, and both seem to have been regarded with peculiar affection by that great literary chief; and it is not improbable that they met and formed their lifelong friendship amid the brilliant circle of wits and poets over which Jonson presided. However this may be, it is known for certain that from an early period the two men lived together on terms of the closest intimacy until the marriage of Beaumont, and that their literary partnership continued until Beaumont's death in 1616. Fletcher survived his friend and fellow-worker only ten years, dying in 1625.

The plays which have come down to us bearing the joint names of Beaumont and Fletcher are very numerous, rather more than fifty in number. Which out of the long list were really the joint productions of the two friends it is in many cases impossible to determine. Some of them were probably written by Fletcher before the literary partnership was formed; some were certainly written by him after that partnership had been dissolved by the death of his colleague. But where to draw the line so as to distinguish precisely the plays belonging to those several periods cannot be accurately ascertained, and still less is it possible to say what portions of the plays jointly written are to be attributed to Beaumont and what to Fletcher. It is a generally received tradition that the genius of Beaumont lay more in the direction of the tragic and pathetic than that of his colleague; while the comic powers of Fletcher were more strongly marked. And this is probable, though not certain. Their plays range over the widest diversity of character, from severe and lofty tragedy, such as the very powerful play of the *Maid's Tragedy*, to the broadest burlesque, like the *Knight of the Burning Pestle*. But the plays from which, probably, all readers derive the greatest amount of pleasure are of a class intermediate between these two extremes. Beaumont and Fletcher have left us a large number of romantic dramas, belonging to much the same class as the majority of Shakespeare's comedies, a class of which the very pleasing play of *Philaster*, the play which is said to have established their fame as dramatists, is an excellent specimen.

The plots of Beaumont and Fletcher's plays are almost all of them, like Shakespeare's, borrowed from Italian novelists or play-writers. They are, for the most part, worked out with discretion and good taste, though the authors show neither the elaborate diligence of Jonson in this department, nor the consummate judgment of Shakespeare. In one point, however, the plays of Beaumont and Fletcher stand especially high, that is, in dramatic effect. Some of the scenes in the *Maid's Tragedy*, especially that in which Evadne, the guilty wife, reveals her infamy to her husband, seem to us among the most striking in all our dramatic literature. In delineation of character these authors are far more life-like than Jonson, though, as compared with the greatest dramatists, they each want both depth and variety. Their style is peculiarly attractive. It is always clear and perfectly intelligible, and though without either the wondrous wealth of metaphor which belongs to Shakespeare alone, or the dignified eloquence of Jonson, it is an instrument admirably adapted for the expression of passion or the simpler purposes of description. The great blot upon the plays of these writers is their indecency. All the literature of their age is coarse, for men's tastes and habits of life were coarse. But the indecency and immorality of Beaumont and Fletcher is not merely a matter of expression; it is too often woven into the very texture of the play, and pervades alike the plot, the characters, and the language. One, at least, of their plays is among the most impure in the language.

A better specimen for study can hardly be chosen among the plays of Beaumont and Fletcher than the play we have already mentioned, *Philaster*. The story is dramatic, if not very probable. Arethusa, the daughter of the King of Sicily, is betrothed to a Spanish prince, but her affections are given to Philaster, the rightful claimant to the throne, excluded from it by the result of an unjust civil war. As the lovers cannot meet openly, Philaster sends to his mistress a beautiful boy, who has by a strange chance come into his service, to be the medium of communication between them. This plan seems to work admirably. But a wanton lady of the Court, detected in a scandalous intrigue with the Spanish prince, in her anger charges the princess with an undue attachment to the boy who attends her. This charge is believed by the king, the courtiers, even by Philaster. The usual wanderings from home and sudden meetings in forests follow. In time Philaster and the boy Bellario get thrown into prison on a charge of attempting the life of the princess. But the people rise against the king, and restore Philaster to his rights; and, all misunderstandings being removed, and all parties reconciled, the play ends happily. Every one of the characters in this play is forcibly and pleasingly drawn. But the main interest centres upon the boy Bellario, in whom, throughout the play, the combination of courageous devotion with a clinging tenderness is exquisitely depicted. In the end Bellario turns out to be no boy, but Euphrasia, the daughter of a lord at the Court, who had been among the most eager of the persecutors of Bellario. The passage in which this discovery is made will afford a good example of the style of Beaumont and Fletcher:—

"My father oft would speak
Your worth and virtue; and as I did grow
More and more apprehensive, I did thirst
To see the man so praised. But yet all this
Was but a maiden longing, to be lost
As soon as found; till, sitting in my window,
Printing my thoughts in lawn, I saw a god
I thought (but it was you) enter our gates.
My blood flew out and back again, as fast
As I had puffed it forth and sucked it in
Like breath; then was I called away in haste
To entertain you. Never was a man
Heaved from a sheep-cote to a sceptre, raised
So high in thoughts as I; you left a kiss
Upon these lips then, which I mean to keep
From you for ever; I did hear you talk
Far above singing. After you were gone,
I grew acquainted with my heart, and searched
What stirred it so; alas, I found it love!
Yet far from lust; for could I but have lived
In presence of you, I had had my end.
For this did I delude my noble father
With a feigned pilgrimage, and dressed myself
In habit of a boy; and for I knew
My birth no match for you, I was past hope
Of having you; and understanding well
That when I made discovery of my sex
I could not stay with you, I made a vow
By all the most religious things a maid
Could call together, never to be known
Whilst there was hope to hide me from men's eyes,
For other than I seemed, that I might ever
Abide with you. Then sat I by the fount
Where first you took me up."

The following is Philaster's account of his meeting with the disguised girl at the fountain:—

"Hunting the buck,
I found him sitting by a fountain-side,
Of which he borrowed some to quench his thirst,
And paid the nymph as much again in tears.
A garland lay him by, made by himself,
Of many several flowers, bred in the bay,
Stuck in that mystic order, that the rareness
Delighted me; but ever when he turned
His tender eyes upon them he would weep,
As if he meant to make them grow again.
Seeing such pretty helpless innocence
Dwell in his face, I asked him all his story.
He told me that his parents gentle died,
Leaving him to the mercy of the fields,
Which gave him roots; and of the crystal springs,
Which did not stop their courses; and the sun,
Which still, he thanked him, yielded him his light.
Then he took up his garland, and did show
What every flower, as country people hold,
Did signify; and how all, ordered thus,
Expressed his grief, and to my thoughts did read
The prettiest lecture of his country art
That could be wished; so that methought I could
Have studied it. I gladly entertained him,
Who was as glad to follow."

ARCHITECTURE.—X.

[*Continued from Vol. VII., p. 384.*]

GOTHIC ARCHITECTURE IN ITALY, GERMANY, AND SPAIN.

THE pointed style, as developed in France, was not recognised in Italy or Germany till the middle of the thirteenth century—that is to say, the round-arched style known as the Romanesque was adhered to for a century after it had been discarded in France. This may be accounted for in Germany from the fact that the round-arched style had already there been carried to such perfection that they were unwilling to introduce a form of arch which was out of harmony with their own national style. In Italy it would seem to have arisen from another cause. We have, in our description of the French cathedrals, pointed out how, in the twelfth or thirteenth century, the demand for painted glass, not only as a decorative feature, but as a field for the display of the history of the Christian religion, had led the French architects to enlarge their windows by the employment of mullions and of tracery, so as to virtually fill up all the wall space that existed between the main piers which carried the vault. In Italy they preferred wall paintings and mosaics, and consequently the walls of their churches were retained and prepared to receive fresco paintings or mosaic pictures, and their windows were kept small and filled with clear glass, so as not to interfere with the colouring of the walls. Their floors were enriched with magnificent marble pavements, and, to keep the interior in harmony, their ceilings were painted blue and enriched with gold stars. This predilection in favour of painting (in which, it is true, they surpassed all the world) was fatal to that appreciation of all those constructive features which, appropriately decorated, were of the very essence of the French and English Gothic style.

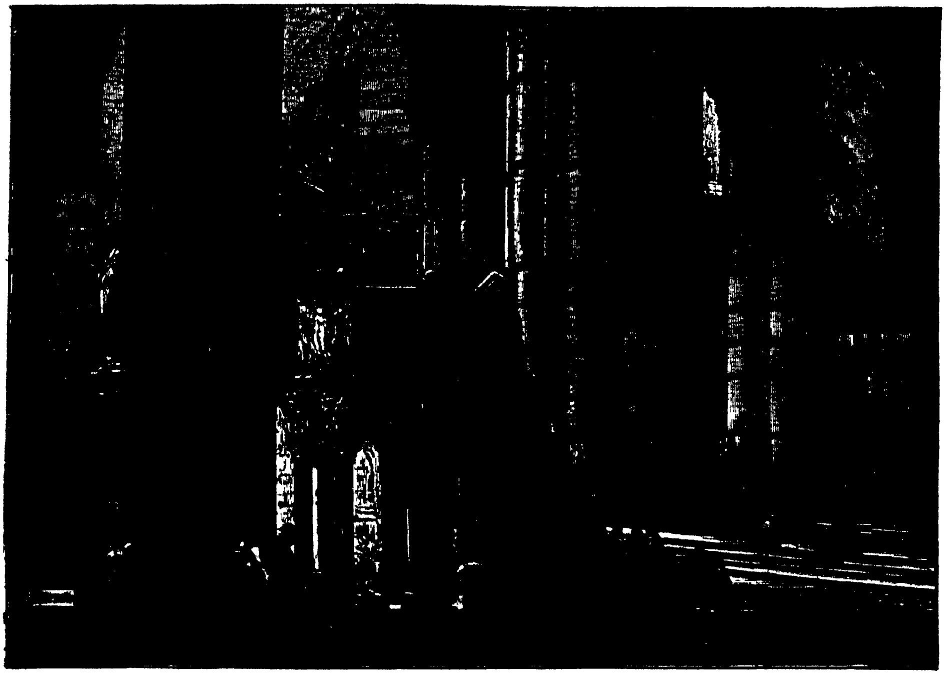


Fig. 88.—SIENA CATHEDRAL.

One well-known example may be taken as an instance of this predilection, viz., the Chapel of the Arena painted by Giotto, and which, without its paintings, is simply a barn. The principal attraction of the Italian cathedrals lies, first, in the beautiful marbles with which they are encrusted both externally and internally (the core of the wall being in brick and stone); and second, the exquisite sculptured figure and ornament with which they are enriched. The forms which the artist was called in to decorate are frequently ungainly and wanting in proportional scale, but the decoration in marbles of varied colours, in mosaic, and with rich sculpture is so beautiful that we forget the masses to which it is applied. Unfortunately, there are many cases in which the decoration has never been applied, and where the original forms of the buildings still retain their ungainly shape; and the system of erecting the building first, and then of calling in another artist to decorate it, has led to the introduction of sham fronts, so that on looking at them from the back we see that the real forms behind them were not adhered to by the artist. This was not done in the earlier buildings, and the cathedral of Pisa, already described under the Romanesque style, is a striking example of truthfulness of construction and of decoration.

The cathedrals of Siena (Fig. 38), Orvieto, Genoa, Ferrara, and Florence may be taken as types of the best examples. The principal front of Siena Cathedral, built 1284–1380, consists of three great portals decorated with sculpture—a rose window lighting the nave in the centre—and is crowned by three great gables, the centre one higher than the others, and all three rising high above the roofs of nave and aisles, and virtually, therefore, shams. It is faced with black, red, and white marbles, richly carved with foliage and figure sculpture.

The towers of Italian cathedrals are invariably separated from the main building, and form what are known as campaniles. The example at Siena is faced with marble in alternate bands of black and white, and is monotonous, owing to its too equal division; it is crowned by a central octagonal spire and four pinnacles, a pleasing variation from the heavy cornice of Prato and other Italian towns. The cathedral of Orvieto was commenced in 1290, but not terminated till the sixteenth century. Its chief characteristic is the mosaic decoration with which its front was encrusted about 1321.

The cathedral of Florence, better known as Santa Maria dei Fiori, is in many respects the finest mediæval church in Italy, though its crowning feature, the dome, was not carried out till the fifteenth century in the Italian style. The plan consists of nave and aisles leading to a central octagon with three apses, north, south, and east. The nave is 55 feet wide and 280 feet long, being divided into four bays only (in Westminster Abbey the same length is divided into twelve bays), so that its size is not apparent. Internally it is wanting in effect, as its walls have never been covered with the frescoes originally contemplated. It is therefore in its exterior that its beauties are chiefly to be found, in the rich marble decoration and in the beautiful tracery of its windows. The front has within the last few years been completed more or less in harmony with the rest. The campanile by Giotto on the south side of the cathedral is the most beautiful example in Italy (Fig. 39). It is decorated with marbles of various colours, and divided into four storeys of different heights, the belfry windows of the upper storey being of great beauty and delicacy, and is, in fact, the only really perfect example of a marble-cased structure; on the lower storey the panels are carved with figure subjects designed by Giotto, but carved out by his pupils after his death. The baptistery on the west side of the cathedral is an octagonal building very classic in design, and chiefly known for the three bronze doors on the north, south, and east sides: the first by Andrea Pisano, 1330; and the other two by Ghiberti, 1400–24.

The church of the Franciscan convent at Assisi, remarkable for its frescoes by Giotto, has architectural features of much value, and in the interior the greater value of having ribs to the vault carried by shafts (instead of painted bands, as in the chapel at Padua before referred to) is at once recognised. The south entrance porch is one of the best examples of geometrical design in Italy.

The cathedral of Milan is the largest in Italy, covering 108,000 square feet. It is entirely cased inside and outside with white marble (excepting the vault, which is painted in imitation tracery), and is profusely decorated with figure sculpture. It was commenced in 1385, and consecrated in 1418, and although the most admired in Italy, is externally of somewhat ungainly form. Internally it is, perhaps, the finest example in Europe; it is divided into nave and double aisles, the latter being almost the same height as the former.

Numerous examples of secular and domestic architecture are found through Italy, chiefly characteristic by their extreme simplicity when contrasted with the rich marble casings of the cathedrals and churches. The chief examples are the Palazzo Vecchio (1298) and the Palazzo del Podestà (1332), both at Florence, and the Palazzo Publico, at Siena (1295–1309), which, with its lofty campanile, forms one of the grandest buildings in Italy.

It is, however, in Venice that we find the best development of secular Gothic architecture. The Doge's Palace (Fig. 40), commenced in 1301, and the Ca d'oro (1350) being the two principal examples. The Gothic portion of the palace consists of the entrance gateway (the Porta della carta), the latest portion built 1439–43—the front facing the piazzetta of St. Mark—and the front facing the Riva de' Schiavoni on the Moto. The building is divided into three storeys: the lower storey of pointed equilateral arches carried on cylindrical piers, with richly carved capitals (the lower portion of these piers is hidden, the pavement of the piazzetta having been raised about 15 feet; they had no bases, but were supported on a stylobate of three steps). The middle storey consists of four central ogee arches with quatrefoil circles of tracery above, all richly moulded, two arches to each one below; the upper storey is equal in height to the two lower ones, it is built in brick and faced with marbles of two colours, forming a design over the whole surface, and is pierced with large painted windows, filled probably at one time with tracery. A pierced stone cresting forms the parapet. The Gothic churches of Venice, of which the principal examples are those of St. Giovanni e Paolo (1246–90) and Santa Maria Gloriosa dei Frari, do not contain any special features which, in a general survey of the style, require notice, so that we now pass on to Germany.

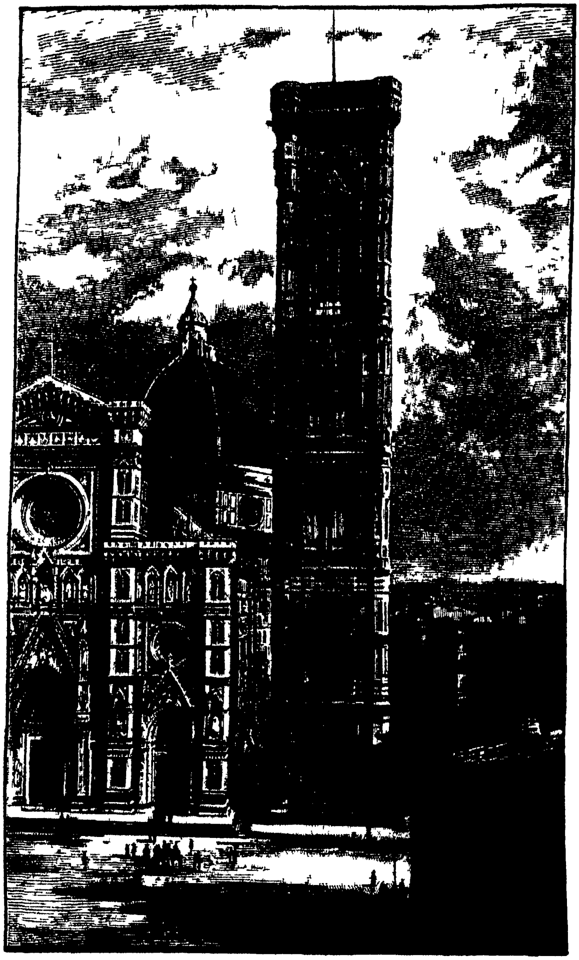


Fig 39.—Giotto's Campanile, Florence.

The German builders clung to their more perfected round-arched Gothic work of the Romanesque type for more than a century after all the chief characteristics of the pointed style had been developed and perfected in France. The two earliest examples of the pointed Gothic style are the church of St. Mary at Treves—built on the site of the round church erected by Helena the mother of Constantine, in imitation of the church of the Holy Sepulchre—and the church of St. Elizabeth at Marburg (1230–40). The next examples are those of Strasburg and of Freiburg in Baden (1270–75)), the latter possessing a lofty western tower with pierced stone spire of great height and of much beauty in design.

The great typical example of German Gothic is found in the cathedral at Cologne, the largest in North Europe, covering an area of 91,000 square feet This was commenced in 1270–75, and its general design was based on the cathedral of Amiens (1220 - 72), the principal difference being that there are double aisles in Cologne (the outer aisles of Amiens being divided into chapels), and the front is virtually sacrificed to the stupendous towers which, crowned by their pierced stone spires, constitute the highest structure in stone ever erected.

The cathedral of Cologne has also the special characteristic of having been based on a uniform design throughout, though constructed at various periods, and the same floor on which the first portion constructed, viz., the choir (finished in 1322), was set out, served still for the setting out of the upper portion of the spires, and was only removed on their completion a few years ago.

The immense height of the vault, 155 feet from the pavement, has the effect of decreasing the apparent length which, though 100 feet longer than Westminster Abbey, including the Confessor's Chapel, really looks much shorter. The great height of the western spires (538 feet) and the enormous dimensions of the towers which carry them dwarf the rest of the building, so that it is only when contrasted with the surrounding buildings that one is able to judge of its stupendous size. Now that these are all being cleared away, this advantage is being lost, and its present effect is that of an overgrown monster.

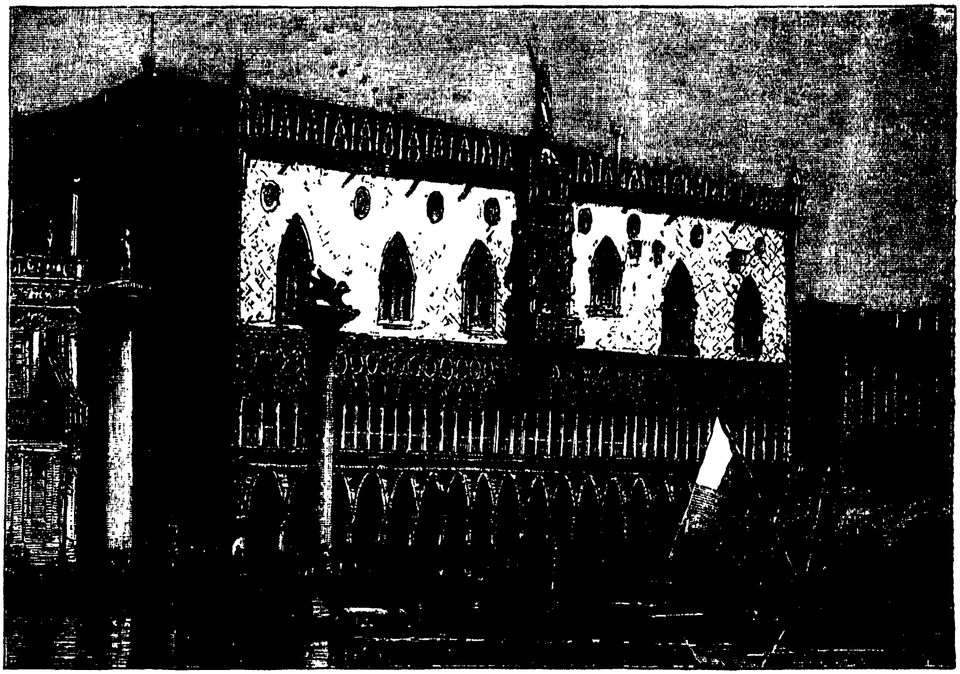


Fig 40.—The Doge's Palace, Venice.

Though of moderate size, the cathedral of Ratisbon in Bavaria is one of the most pleasing examples of German Gothic, and it has the advantage of retaining the German apsidal termination to choir and aisles. The church of St. Stephen's in Vienna is an example of a type which, though common in Germany, and more particularly in the Baltic provinces, as at Lübeck, Danzig, and other towns, is rarely found in other countries. The nave and aisles are of the same height, and are covered by one stupendous roof. There is consequently only one storey inside, the triforium storey and the clerestorey do not exist, and all the light to the interior is admitted through the aisle windows, and although these rise to the height of the vault, the effect inside is sombre and dark.

Of civic buildings in Germany the Town Hall of Brunswick is one of the few examples in stone remaining. In the north provinces on the Baltic, at Lübeck and Danzig, and in Hanover, are fine buildings in brick and terra-cotta, which are remarkable for the clever way in which, with so small a material as brick, they have been able to obtain a monumental effect. The finest example, however, in the north of Germany, is the great palace at Marienburg, once the residence of the Knights of the Teutonic Order; this was built at the end of the thirteenth century. The great hall of the knights is lighted by windows filled with stone tracery, one of the few examples of this material being used in this part of the country. Some of the Bavarian towns still retain Gothic buildings of similar work, the best examples being found in Nuremberg; here also still remain, as well as at Amberg and Rothenburg, the greater portion of the city walls with the fine circular towers, which add so much to the picturesqueness of the first named. Rothenburg also retains more or less the character of a mediæval city, like Carcassonne.

The steadily growing wealth of Flanders, from the eleventh to the sixteenth century, enabled her to erect cathedrals and churches of considerable importance, but she does not seem to have shared that sudden impulse given to church construction in the fourteenth and fifteenth centuries. The erection of these great ecclesiastical buildings seems to have been spread pretty equally over the five centuries above named, and she carried on the development of the style, and continued the erection of Gothic churches for nearly a century after other European countries.

The most important examples are the cathedral of Tournay, the greater portion of which, however, belongs to the Romanesque period; St. Gudule, Brussels (1220), and St. Martin, Ypres (1254), the finest and purest specimen in Flanders.

Later on we have St. Rombaud at Malines (1352–61), and the cathedral of Antwerp (1352–1411). The latter is one of the most remarkable churches in the country, covering an area of 70,000 square feet, and being singular in the fact of its having a nave with three aisles on each side, the outer aisles (added at a later period) being almost of equal width with the nave. This series of aisles adds greatly to the effect of space of the interior, but one feels the want of a greater width of nave in order to assert its predominance and its greater influence on the aisles. Externally, its chief noticeable feature is the lofty north-west tower and spire (406 feet high), the latter being decorated with that beautiful pierced tracery which exists in Freiburg and Vienna. It was intended to carry the south-western spire to the same height, which would have destroyed the picturesque value of the group. In the later churches of Flanders they reverted to the plain cylindrical piers or columns instead of the complicated piers with numerous attached shafts, which in St. Ouen and other later churches in France were condemned for their wire-drawn effect, and these simple circular piers give great breadth to the internal effect. Where, however, the cities of Flanders take the lead of all other European countries is in the municipal buildings which in the times of her greatest prosperity, from the thirteenth to the fifteenth centuries, she erected in the Gothic style. Of these the earliest is the Cloth Hall of Ypres, built in the thirteenth century, a building 440 feet in length. Then in the fourteenth century follow the Town Hall and Trade Hall of Bruges, and in the beginning of the next century the Town Hall of Brussels, with its magnificent tower and spire, 374 feet high.

The Town Halls of Louvain and Audenaerde are the most elaborately decorated civic buildings of the style. One of the latest buildings in the style is the Town Hall of Ghent, in which the beauty of the lacework tracery of the windows, balconies, and cornices of the building is set forth by the plain simple masonry of the lower part. The Town Hall of Middelburg in Holland ranks second only to that of Ghent, and in all cases these civic buildings are decorated with sculptural figures, not only of historic but great artistic value.

The earlier Gothic cathedrals of Spain were all based on French Gothic work, but there are one or two special features in them which demand notice. The Spanish seem to have been the only European nation who recognised the value of the dome as the grandest form of vault to cover over the intersection of the nave and transepts, and at Toledo, Salamanca, Burgos, and Seville this is the chief original feature they introduced. The nave of Gerona Cathedral also is remarkable for the great span of its vault, which is 78 feet wide. This width of nave is obtained by the omission of the arches, the thrust of the arch being transmitted down immense buttresses, between which are placed a series of chapels.

The largest cathedral in existence, with the exception of St. Peter's at Rome) is the cathedral of Seville, which covers an area of 124,000 square feet; its length is 415 feet, its total width 298 feet. The nave is 56 feet wide, the height of vault being 145 feet. There is the same defect here in apparent length to which we have before alluded; there are only nine bays in the total length of the church, including the transept: each bay, therefore, is of unusual width, and the four piers carrying the central dome are 16 feet in diameter.

The Gothic period in Spain lasted up to the middle of the sixteenth century, and the elaboration of its tracery and decorative stonework exceeds even that of the Flamboyant period in France. The domestic work, on the other hand, like that of Italy, retains much of that simple masonry without decoration which gives such value to the rich tracery of their windows, and to the elaborate arcading which forms an open loggia on the upper storey or decorates their patios or internal courts. In the south of Spain the Moorish influence has often resulted in the decoration of their towns with coloured tiles or rich arabesque ornament.

This was followed by an Italian period, of which the Escurial (1563–90) is the best known example. This, however, applies more to the church, which forms its leading feature, and which is more or less a copy of Italian examples; the rest of the palace retains, in its angle towers, steep roofs, and gable ends, traces of the earlier Renaissance style. Then follows a fairly pure Italian work, the palace of Charles V. in the Alhambra; the palace of Madrid (1737–55) being the last work of any importance. But before this, especially in church work, a Rococo style of extremely decadent details had crept in.

COMMERCIAL CORRESPONDENCE.—VII.

[*Continued from Vol. VII., p.* 328.]

FRENCH, GERMAN, AND ENGLISH.

39.—LETTER WITH STATEMENT OF ASSETS AND LIABILITIES.

Manchester, July 17th, 18—,

Messrs. Wybourne & Ashford, Liverpool.

Gentlemen,—You will doubtless be acquainted with the sad position of trade in Germany, from the effects of the unsettled state of political affairs in that country.

Under these circumstances, it is quite impossible at present for the manufacturers to effect any sales, or even to raise money upon their stocks, which are considerable.

As you are aware, our chief business is with Germany, especially with ———, the very centre of the war; you will therefore easily understand that we are affected to a considerable extent by this unfortunate state of things.

For the last twelve months we have very much restricted our transactions, and endeavoured, but unhappily without much success, to collect our outstanding debts.

It is therefore with the deepest concern that we are under the painful necessity of informing you that, for the present, we are unable to meet all our engagements.

We enclose an approximate statement of our assets and liabilities, from which you will perceive that the former greatly exceed the latter, so that even allowing 25 per cent. for any *bad* debts, there will still be sufficient to pay our creditors in full.

Our debtors, as you will see by the same statement, were all good houses, whose difficulties arose in consequence of the events before mentioned, and we doubt not that they will be able to resume their payments as soon as political affairs become a little more settled, and they are able to dispose of their goods.

We are preparing a balance-sheet, which we shall lay before our creditors at the meeting which we purpose holding on Monday, the 22nd, and at which we hope you will be present, so that we may submit to you the exact state of our affairs, and, we hope, arrive at an arrangement.

We are, Gentlemen,
Yours most obediently,
A. MORI & Co.

Manchester, le 17 *juillet*, 18—.

Messieurs Wybourne & Ashford, à Liverpool.

Messieurs,—Vous aurez sans doute connaissance de la triste position dans laquelle se trouve le commerce en Allemagne par suite de l'état incertain des affaires politiques de ce pays.

Dans ces circonstances, il est pour le moment impossible aux fabricants d'effectuer des ventes, ou même de se faire de l'argent sur leur marchandises, qui sont considérables.

Sachant que nous faisons nos principales affaires avec l'Allemagne et surtout avec ———, actuellement la théâtre de la guerre, vous comprendrez facilement que le triste état des choses doit nous affecter beaucoup.

Depuis l'année dernière, nous avons considérablement restreint nos affaires et fait tous nos efforts pour effectuer la rentrée de nos fonds, mais malheureusement sans grand succès.

C'est donc à notre grand regret que nous nous trouvons dans la triste nécessité de vous informer que pour le moment nous ne sommes pas à même de faire honneur à tous nos engagements.

Nous vous remettons ci-inclus un relevé approximatif de notre actif et passif, par lequel vous verrez que le premier excède de beaucoup le dernier, de sorte que, même en allouant 25 pour cent pour les *mauvaises créances*, il y aura suffisamment pour payer tous nos créanciers.

Comme vous le verrez par ce même relevé, nos débiteurs étaient tous de bonnes maisons, mais qui se trouvent maintenant en difficultés par suite des événements ci-dessus mentionnés, et nous ne doutons pas qu'ils soient à même de reprendre leurs paiements aussitôt que les affaires politiques auront pris une tournure plus calme, qui leur permettra de vendre leurs marchandises.

Nous préparons notre bilan pour soumettre à la réunion des créanciers, que nous pensons convoquer pour le Lundi 22; nous espérons que vous voudrez bien y prendre part, afin de pouvoir vous présenter l'état exact des nos affaires et d'arriver, nous l'espérons, à un arrangement.

Recevez, Messieurs,
Nos salutations respectueuses,
A. MORI & CIE.

Mancheſter, 17. Juli, 18—.

Herren Wybourne & Aſhford, Liverpool.

Es wird Ihnen ohne Zweifel bekannt ſein, in welch' trauriger Lage ſich der Handel in Deutſchland befindet, in Folge des ungewiſſen Zuſtandes der politiſchen Verhältniſſe in jenem Lande.

Unter dieſen Umſtänden iſt es für den Augenblick den Fabrikanten ganz unmöglich Verkäufe abzuſchließen, oder ſelbſt Vorſchüße auf ihre beträchtlichen Vorräthe zu erhalten.

Wie Sie wiſſen, machen wir unſer Hauptgeſchäft mit Deutſchland, ſpeciell mit ———, dem Hauptſitz des Krieges, und werden Sie daher leicht verſtehen, daß wir von dieſer unglücklichen Sachlage ſtark berührt werden.

Während der letzten zwölf Monate haben wir unſern Umſatz ſehr eingeſchränkt, und uns bemüht, leider mit wenig Erfolg, unſere ausſtehenden Forderungen einzuziehen.

Wir finden uns daher zu unſerm tiefſten Bedauern in der traurigen Lage Sie davon zu benachrichtigen, daß wir vorerſt nicht im Stande ſind, allen unſeren Verpflichtungen nachzukommen.

Anbei finden Sie eine annähernde Aufſtellung unſerer Activen und Paſſiven, aus welcher Sie erſehen werden, daß die Erſteren die Letzteren bedeutend überſteigen, ſo daß ſelbſt bei einer Reſervirung von 25 Procent für irgend welche ſchlechte Schulden genügend übrig bleiben wird um alle unſere Gläubiger zu bezahlen.

Wie Sie aus derſelben Aufſtellung erſehen, waren unſere Schuldner alle gute Häuſer, deren Schwierigkeiten aus den erwähnten Ereigniſſen entſtanden, und wir zweifeln nicht daß dieſelben in der Lage ſein werden ihre Zahlungen wieder aufzunehmen ſobald die politiſchen Zuſtände ſich etwas beruhigt haben, und ſie ihre Waren verkaufen können.

Wir prepariren einen Bücherabſchluß, den wir unſern Creditoren bei einer Montag den 22. curr. ſtattfindenden Verſammlung vorlegen werden, und rechnen wir auf Ihr Erſcheinen, um Ihnen die actuelle Poſition zu unterbreiten, und, wie wir hoffen, ein Arrangement herbeizuführen.

Hochachtungsvollſt,

A. Mori & Co.

40.—LETTER ASKING FOR STATEMENT OF ACCOUNT CURRENT.

Paris, September, 1891.

Messrs. J. R. & N. Richman, London.

Gentlemen,—We are in receipt of your favour of . . . contents of which are noted.

As we are about to close our accounts on the 30th September, we should feel obliged by your sending us an extract of our account current with you up to that date. You may draw upon us for the balance in your favour at three days' sight, which draft will meet with due honour on presentation.

We remain, Gentlemen,

Yours truly,

B. SOYER & CO.

Paris, septembre, 1891.

Messieurs J. R. & N. Richman, à Londres.

Messieurs,—Nous avons reçu votre lettre du . . et pris bonne note de son contenu.

Réglant nos écritures au 30 septembre, nous vous serions bien obligés si vous vouliez nous envoyer le relevé de notre compte courant chez vous, arrêté à cette date.

Pour le solde nous vous autorisons à disposer sur nous à trois jours de vue; nous réserverons bon accueil à votre traite.

Nous vous présentons, Messieurs.

Nos sincères salutations,

B. SOYER & C^{IE}.

Paris, September, 1891.

Herren J. R. & N. Richman, London.

Wir empfingen Ihr Werthes vom . . . vorgemerkten Inhalts.

Da wir im Begriff ſind unſere Bücher am 30. September abzuſchließen, erſuchen wir Sie um einen Rechnungsauszug per jenes Datum.

Sie wollen den ſich zu Ihren Gunſten ergebenden Saldo drei Tage Sicht auf uns entnehmen, und bereiten wir Ihrer Tratte gebührenden Schutz bei Erſcheinen vor.

Hochachtungsvoll,

B. Soyer & Co.

41.—ACKNOWLEDGMENT OF INVOICE, ETC.

Bradford, *August* 14*th*, 1891.

Messrs. Simon & Co., Marseilles.

Gentlemen,—We have duly received your favour of the 10th instant, enclosing invoice of 25 bales of cotton, amounting to 6,300 fr., which we have placed to your credit.

To balance this item, please draw upon us at three months' date, informing us of the sterling amount of your draft.

If you have another small lot of similar quality to offer, we should feel glad to receive samples as early as possible.

We remain, Gentlemen,

Yours truly,

ROBERT PALMER & SON.

Bradford, *le* 11 *août*, 1891.

Messieurs Simon et C^{ie}, à Marseilles.

Messieurs,—Nous avons bien reçu votre honorée en date du 10 courant, renfermant facture à 25 balles de coton, montant à frs. 6,300, dont nous vous créditons.

Pour balancer cette affaire, veuillez disposer sur nous à trois mois de date, et nous informer du montant de votre traite en livres sterling.

Si vous avez un autre petit lot de la même qualité à nous proposer, nous serions enchantés d'en recevoir des échantillons aussitôt que possible.

Agréez, Messieurs,

Nos salutations amicales,

ROBERT PALMER & FILS.

Bradford, 14. Auguſt, 1891.

Herren Simon & Co, Marſeilles.

Wir bekennen uns zum richtigen Empfang Ihres Geehrten vom 10. curr. mit Factura über 25 Ballen Baumwolle im Betrage von fs. 6,300, welche Summe wir Ihnen creditirt haben.

Um dieſen Gegenſtand auszugleichen, wollen Sie 3 Monat dato auf uns ziehen und uns den Sterling Betrag Ihrer Tratte aufgeben.

Falls Sie eine andere kleine Partie ähnlicher Qualität zu offeriren haben ſollten, würde es uns angenehm ſein, Muſter davon baldmöglichſt zu erhalten.

Hochachtungsvollſt,

Robert Palmer & Sohn.

42.—Letter about Missing and Damaged Goods.

Paris, May 9th, 1891.

Messrs. Smith, Martin & Co., London.

Gentlemen,—We are in receipt of the package marked S M 3, advised by your letter of the 2nd inst., and regret to state that, on comparing its contents with the invoice you sent us, we find there are five articles missing, and three others so full of spots and faults that they are quite unsaleable.

We therefore take the liberty of deducting the value of those eight articles from the amount of your invoice, which, in consequence, will be reduced to £270 10s. 0d., which we have placed to your credit.

Believe us, Gentlemen,

Yours respectfully,

Charles Laine & Co.

Paris, le 9 mai, 1891.

Messieurs Smith, Martin et C^{ie}, à Londres.

Messieurs,—En possession du ballot marqué S M 3, avisé par votre lettre du 2, nous avons le regret de vous informer qu'en comparant le contenu de ce ballot avec la facture que vous nous avez envoyée, nous trouvons qu'il y a un manque de cinq pièces, et que trois autres sont tellement couvertes de taches et de défauts qu'elles sont tout-à-fait invendables.

Nous prenons donc la liberté de déduire la valeur de ces huit pièces du montant de votre facture, qui se réduira en conséquence à £270 10s. 0d., dont nous vous créditons.

Nous vous saluons, Messieurs,

Bien cordialement,

Charles Laine & C^{ie}.

Paris, 9. Mai, 1891.

Herren Smith, Martin & Co., London.

Wir beſitzen das Packet S M 3 welches Sie mit Ihrem Briefe vom 2. curr aviſiren, und bedauern bemerken zu müſſen, daß wir bei Vergleichung des Inhaltes mit der Factura fünf Artikel vermiſſen, während drei andere ſo voll von Flecken und ſo fehlerhaft ſind, daß ſie ganz unverkäuflich ſein werden.

Wir nehmen uns daher die Freiheit den Werth dieſer acht Artikel von dem Betrage Ihrer Factura zu kürzen, welcher dadurch auf £270 10s. 0d. reducirt wird, wofür Sie erkannt ſtehen.

Hochachtungsvoll,

Charles Laine & Co.

43.—Letter on Exorbitant Charge for Interest.

Berlin, March 2nd, 1891.

Messrs. Arnold & Co., London.

Gentlemen,—We are in possession of . . . from which we unfolded the extract of our account current with you, showing a balance in your favour of £5,682 3s. 6d. to 31st December, 1890, which we shall examine and carry forward in conformity, if found correct.

On looking through the account, we perceive that you charge interest at the rate of 7 per cent., which, permit us to remark, we find rather high, seeing that the average rate of discount at the Bank of England, during the last year, did not exceed 6½ per cent.

An explanation on this point would oblige,

Yours truly,

Adolphe Appelu & Co.

Berlin, le 2 mars, 1891.

Messieurs Arnold & C^{ie}, à Londres.

Messieurs,—Favorisés de votre lettre du . . . nous en avons retiré le relevé de notre compte courant chez vous, présentant un solde en votre faveur de £5,682 3s. 6d. au 31 décembre, 1890; nous l'examinerons, et le porterons à compte nouveau, après vérification.

En examinant cet extrait, nous nous apercevons que vous calculez les intérêts au taux de 7 pour cent, ce qui, permettez-nous de vous le faire observer, est un peu élevé, considérant que la moyenne de l'escompte à la Banque d'Angleterre, pendant l'année dernière, ne dépassa pas 6½ pour cent.

Quelques explications à ce sujet nous obligeraient.

Nous vous saluons sincèrement,

Adolphe Appelu & C^{ie}.

Berlin, 2. März, 1891.

Herren Arnold & Co., London.

Wir beſitzen Ihr Werthes vom . . . dem wir Ihren Rechnungsauszug entfalteten, mit einem Saldo von £5682 : 3 : 6 per 31. December, 1890, zu Ihren Gunſten; wir werden denſelben prüfen und bei Rechtfinden conform mit Ihnen vortragen.

Beim Durchſehen Ihres Auszuges bemerken wir, daß Sie Zinſen zu 7 Procent berechnen, welchen Satz wir—geſtatten Sie die Bemerkung—ziemlich hoch finden, da die Durchſchnitts Disconto Rate der Bank von England während des letzten Jahres 6½ Procent nicht überſtieg.

Eine Erklärung dieſes Punktes würde uns verbinden.

Hochachtungsvoll,

Adolphe Appelu & Co.

LIGHT.—VI.

Continued from Vol. VII., p. 370.]

MICROSCOPES.

We have seen that a double convex lens will cast an image of an object on to a screen. If the screen the image is directly cast on to be the back of the eye, and the conditions are such that the image now appears to the sight greater than the object, our double convex lens has become a magnifier or microscope. The single or simple microscope is a double convex lens. A flask full of water laid on a page of a book makes the letters look bigger. A test tube (Fig. 50) filled with water and tightly corked up also magnifies the letters, and may be conveniently used as a reading-glass, although, of course, on account of its cylindrical form, it magnifies only in one direction.

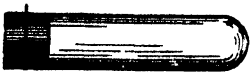


Fig. 50.

The single lens used as a magnifier or microscope is very much employed by the field naturalist, and with such an instrument, or with a double convex spectacle glass, we may gain an idea of how one ascertains the number of times it magnifies. Hold the glass in the sun's rays, and see at what distance it forms a perfect image of the sun on a sheet of paper. Measure the distance: it is the focal length of the lens. Next hold the lens close to the eye, and measure the distance at which you read most distinctly with it, *i.e.*, the number of inches from the lens to the page. The magnifying power of all such lenses is obtained by dividing the distance at which we see the object most distinctly by the focal length. If the former is an inch and three-quarters and the latter an inch and a quarter, the magnifying power will be

$$\frac{1\frac{3}{4}}{1\frac{1}{4}} = 1\tfrac{2}{5}\text{ths.}$$

A line seen with the lens will appear $\frac{2}{5}$ths longer than it is, and the number expresses the linear magnifying power of the glass. If we could read distinctly with a lens 5 inches from the page, and it had a focal length of 1 inch, its linear magnifying power would be 5, and its superficial magnifying power would be this number squared, viz., 25.

HOW TO MAKE A SIMPLE MICROSCOPE.

With minute single lenses great discoveries were made last century. To make a lens of this sort, take a piece of glass rod and hold it in the gas flame until it softens, then draw it out into two halves (Fig. 51). Each half has a thread of glass attached to it, and if the end of one of these threads be held in the flame it melts and forms a globule of glass. Break the globule off and press it into a small round hole which has been pierced in a thin slice of cork with a red-hot needle. With this lens held close to the eye, the point of a pin brought close to it appears nearly as blunt as the end of one's little finger. Any object one wants to examine with it will have to be examined in this way attached to the end of the pin brought close to the globule of glass mounted in the cork. With such an instrument and by such a method Leeuwenhoek made a host of discoveries regarding the minute structure of things, which were communicated to the Royal Society of London some two hundred years ago.

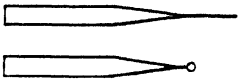


Fig. 51.

LIQUID SIMPLE MICROSCOPES.

Magnifying lenses may be formed by drops of liquid. Thus a drop of water suspended from a sheet of glass forms a plano-convex lens, which will act as a simple microscope (Fig. 52). Sir David Brewster succeeded in making a lens of the kind of Canada balsam with a focal length of only one fiftieth of an inch, and preserved it for many years. Drops of water or of oils and varnishes inserted in small apertures have also been employed as simple microscopes.

Fig. 52.

THE CODDINGTON LENS.

There are some marked defects attending the use of spherical lenses as simple microscopes. There is too much dispersion, and there is also too much spherical aberration, *i.e.*, the image is in some measure distorted by the marginal rays not being properly brought to a focus by a spherical lens. The dispersion and aberration are lessened by having the equatorial zone of the lens ground away, as seen in section, Fig. 53. This device is usually called the Coddington lens; it was devised, however, by Sir David Brewster.

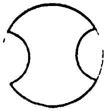


Fig. 53.

HOW THE SINGLE LENS MAGNIFIES.

The action of a double convex glass in magnifying will be apparent on a few minutes' consideration of Fig. 54. An object A B is examined by means of the lens L. A ray from A passes through the lens L, is bent or refracted, and entering the eye is further refracted by the crystalline lens C, and is finally cast on to the back of the eye or retina at the point A′. Light from B suffering the same influences is cast on to the retina at B′. An image A′ B′ is thus obtained on the retina, which is much larger than it would be if the lens L were not interposed—in other words the double convex lens L has acted as a microscope.

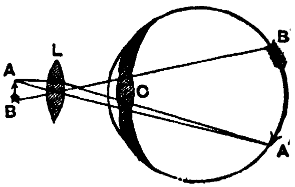


Fig. 54.

THE COMPOUND MICROSCOPE.

The simplest form of compound microscope consists of two convex lenses, the one nearest the object being called the object-glass, and that nearest the eye the eye-glass. The object-glass forms an image of the object which is magnified by the eye-glass. Thus the object A B has an image A′ B′ formed by the object-glass L, and this is magnified by the eye-glass E, the enlarged image A″ B″ being received on the retina (Fig. 55). The paths of the rays producing this image are shown in the diagram.

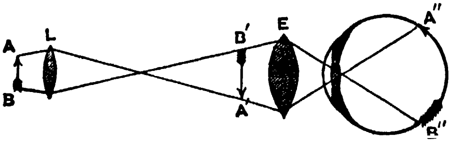


Fig. 55.

Owing to an apparent visual anomaly the object A″ B″ cast on the retina in an upright position seems to the visual sense inverted, and any movement of the object across the field of view is similarly contrariwise to what it appears, thus a movement of the object observed to the right appears with such a combination of lenses a movement to the left.

The modern compound microscope is somewhat more complicated than the arrangement given in Fig. 56. The eye-piece, for example, contains two plano-convex lenses, E E and F F, *i.e.*, a so-called field-glass F F, in addition to the eye-glass E F, and the object-glass consists of two or generally three double lenses. The arrangement of two plano-convex glasses for the eye-piece was devised by Huygens, and is called the *Huygenian eye-piece*. These lenses are placed within a tube, the eye-piece at E and the object-glasses at O (Fig. 57). There is a stage S with a circular orifice, through which light can be reflected by the mirror M. If one be examining a transparent object, the glass slip on which it rests is placed on the stage, and light from a lamp is sent by the mirror M through the object into the microscope. The tube E O is next gradually lowered until the thing to be examined is in focus. Should the object be an opaque one, a lens L is used for concentrating light on it while it rests on the stage, and it is viewed by reflected light.

Fig. 56.

WHO INVENTED THE MICROSCOPE?

It is not known who first applied the single lens as a microscope, but it is highly probable that it was so used by the ancients. The Jansens of Middelburg are credited with the invention of the first compound microscope, and instruments made by the father and son were presented to Prince Maurice and Albert, Archduke of Austria. The Archduke's microscope came into the hands of Cornelius Drebell, who is sometimes spoken of as the inventor of the compound microscope. In external appearance it was a gilt copper tube an inch in diameter and six feet long, supported by three brass pillars in the shape of dolphins on a base of ebony, which also served the purpose of a stage for the objects.

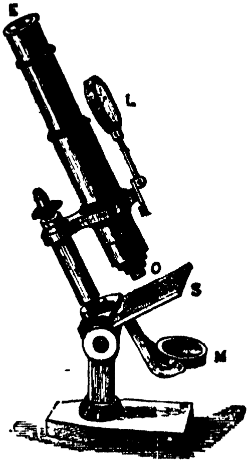


Fig. 57.

THE ASTRONOMICAL TELESCOPE.

The simplest form of telescope is a tube with two double convex lenses in it, so that at first it appears to one in no respect different from the compound microscope. In the telescope, however, rays from the object, proceeding from a distance, fall upon the object-glass nearly parallel to each other, and are brought to its principal focus within the tube, whereas in the compound microscope the rays from the object proceeding from a very short distance, enter the object-glass highly divergent, and form a magnified image beyond the principal focus.

Obtain a couple of double convex lenses, one with a focal length of, say, thirty-six inches, and the other with a focal length of an inch. The larger lens will make the object-glass, and the lesser one the eye-glass of an astronomical telescope. The focal lengths multiplied into each other will give the length of tube they have to be placed in, in this case thirty-six inches. Therefore take a tube, either of cardboard or tin, of the diameter of the object-glass, and fix the glass in one end. In the other end have an easily sliding tube more than six inches long, and into its outer open end fix the eye-glass. The inside of each tube must be blackened and the diameters of the lenses must be reduced by fixing in front of them rings of cardboard (Fig. 58) to cut off the marginal rays. The object of these rings—"stops," or "diaphragms"—is to eliminate the coloured ring from the field of view due to chromatic aberration. (*See* lesson V.)

With such a telescope objects are inverted; this, however, does not interfere with its use in viewing the stars or planets, or forming part of an instrument like the spectroscope. In a telescope employed for viewing objects on land they must appear in their natural positions upright. This is effected by the addition of two convex eye-glasses to the astronomical telescope, or by the substitution of a double concave lens for its convex eye-glass.

Fig. 58.

THE TERRESTRIAL TELESCOPE.

The arrangement of lenses is as in Fig. 59. To the object-glass O and the eye-glass E of the astronomical telescope, there are two more eye-glasses E′ and E″ added. E′ and E″ have the same focal lengths as E, and they are placed a distance apart equal to the sum of their focal lengths. An upright image is formed in the principal focus of E′ at *a*, and this is seen erect with the eye-glass E″.

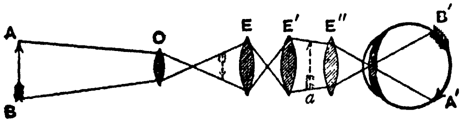
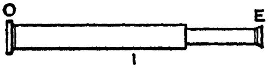
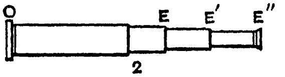


Fig. 59.



Astronomical Telescope.



Terrestrial Telescope.

Fig. 60.

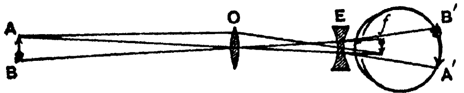


Fig. 61.

Each eye-glass being placed at the end of a sliding tube, there is a difference in external appearance in the astronomical and terrestrial telescopes, which is shown in Fig. 60.

THE GALILEAN TELESCOPE.

The Galilean telescope shows objects in an erect or natural position, and it consists of an ordinary double convex object-glass, and a biconcave eye-glass of small focal length as in Fig. 61. This is the plan on which opera-glasses are constructed. The rays of light pass through the object-glass and would be brought to a focus at *f* within the eye were it not for the interposition of the double concave lens E, which diverts them and makes them divergent instead of convergent, so that a magnified image of the object is cast on to the retina, and the thing looked at appears erect and in its natural position.

THE REFLECTING TELESCOPE.

In the telescopes so far described refraction solely is concerned; in the reflecting telescope we have a combination of reflection and refraction. A simple illustration will enable the reader to see the principle on which it is constructed. A burnished spoon is held with its hollow towards a gas flame; an image of the flame is seen by the observer with his back to the light, and this he may magnify by means of a pocket lens. Such is practically the arrangement of a reflecting telescope. (Fig 62.) A highly burnished concave mirror *s* of long focus is fixed at one end of a tube. The rays which enter the mouth of the tube *m* from the distant object are reflected back to an oval piece of plane mirror at *r*, which directs the rays into the eye-piece *e*. The observer at *e* sees a magnified image of the object towards which the telescope is directed. This form is usually termed the Newtonian telescope, and its magnifying power is equal to the focal length of the parabolic reflector at *s*, divided by that of the eye-glass at *e*. Sir William Herschel constructed one of these telescopes forty feet long in 1789, but his marvellous work was eclipsed by Lord Rosse in 1844, who constructed one with a reflector of fifty-four feet focal length!

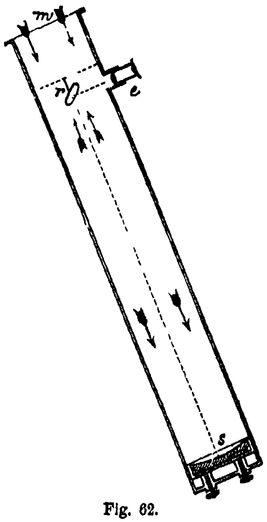


Fig. 62.

POLITICAL ECONOMY.—VI.

[*Continued from Vol. VII., p.* 338.]

TRADES UNIONS.

WE have spoken hitherto as if there were nobody concerned in fixing the actual payment of wages but employers and workmen, and as if workmen in a trade fixed the rate of wages by bidding against each other. This is the assumption made for simplicity, to begin with, by abstract political economy. In practice, however, the employers being much more able to combine than the workmen, the latter have found it necessary to combine too—partly to maintain their claims to a fair share in the aggregate product, partly to secure the observance of trade rules and customs, partly to give themselves a better chance in the bargaining which tends to settle the price paid for labour. Such combinations are familiar in history; in England in the middle ages we find craft guilds (including both masters and journeymen) fixing the rate of wages, and seeing that trade rules were observed. As the conditions of trade altered with the increase in machinery, these rules, and the "Statute of Apprenticeship" before spoken of (which was held to be limited to certain towns and trades) became so burdensome that manufacturers tried to get away from the towns where they were enforced; and so towns like Worcester or Coventry declined, while places like Nottingham, Leeds, Dewsbury, Oldham, Westbury in Somerset, and many others grew from villages into towns. Trade unions, then, arose, in most trades, about the end of the last century, when the general introduction of machinery and the factory system of production had upset all the old rules. Strict laws were made against such combinations of workmen at various times in this century; but trade unions are now fully recognised, and few people would now say that, whatever mistakes they may occasionally make, society as a whole could well do without them altogether.

No doubt in the bargaining we have spoken of, each side must occasionally try and enforce its own view by a lock-out or a strike, which involves enormous waste and loss. But without a strong combination on both sides there could be no proper bargaining at all. And the stronger the combination, the more it will have at stake, the more likely it is to be wisely and prudently led, and the greater the prospect of a settlement of disputes without resort to a strike.

SOME SUGGESTED REARRANGEMENTS OF THE SYSTEM OF DISTRIBUTION.

PRODUCTIVE CO-OPERATION.

It has often been asked, cannot labourers be their own employers? Suppose that the men in a certain trade save or borrow capital, form a company, work for it themselves, and divide the proceeds. They would then receive interest (if the capital were their own) and, at any rate, "*entrepreneur's* profit." And as their gains would depend directly on the prosperity of the company, they would have every inducement to do their very best for it, which in practice a workman earning wages has not.

This plan has often been tried in England, but without conspicuous success. Some few such societies have done well, many ill. The management has been bad, or the capital too small, or both. The plan (so far as can be judged at present) rather overlooks the facts (1) that ability of management is rare, and commands a higher price in the market than most of such societies can afford to pay; and (2) that individual business talent and promptitude cannot well be replaced by that of a board of management, which necessarily moves more slowly and takes more time to see what is to be done.

All the capital invested in such *purely* productive co-operative societies in England to-day amounts to less than £1,000,000, or less than the amount owned by some single firms or companies worked on the *entrepreneur* system.

[We must, of course, distinguish this *productive co-operation* from *distributive co-operation*, which has in many ways been a very great success, and deserves high praise. This latter type aims at "getting rid of the middleman," and at giving the purchasers of goods a share in the profits on the sale, which are periodically divided among them in proportion to their purchases. Some of these societies—the best known of which is the "Rochdale Pioneers"—have also an educational and social side, and do much to promote a corporate feeling among their members as well as a spirit of thrift. They sometimes also manufacture goods, but their main business is not production but distribution in a way offering more advantages, economic and moral, than that of ordinary retail trade.]

Profit sharing has proved more successful, particularly in France. There are many schemes, but the principle in all is the same. A certain portion of the profits is put aside in each year to be distributed among the workmen besides their wages, so that they have every inducement to increase the total.

But a much more comprehensive scheme—or set of schemes—is proposed under the name of Socialism. There are many Socialist parties, some four or five being of considerable importance and numbers in England or on the Continent, and they differ widely both in the details of the schemes they propose and the way they seek to carry them out. But the essential part of all the systems is this: that all the means of production and transport in the country—land, machinery, raw material, mines, ships, railways—shall cease to be private property and shall belong to the State (or perhaps to the various local authorities), which shall either work them itself or let them to productive co-operative societies (opinion now seems to incline to the former). Each person who is able to work shall be obliged to work at something, and be paid by the State. He will be free to do what he likes with his earnings, only he must not compete with the State by investing them as capital. In this way, it is held, the State would get the rent and profits which now pass into private hands, would be able to apply them to a fairer distribution of wealth, and in other ways beneficial to society, and would secure to everyone a fair maintenance; besides which, by settling how much should be produced, it would be able to prevent the crises and depressions of trade now caused by production in excess of demand.

Now the actual structure of commercial society is in some respects more like the Socialist ideal than like the state assumed by political economy. Instead of individual landlords, labourers, and capitalists, we have large joint-stock companies, labourers organised in unions, State-regulated railway rates, and frequent State interference with industry, while both the State and the municipalities are large employers of labour, and some English towns own their gas and water works and tramways, which elsewhere are left to private enterprise. But the theory was invented long before the collective production of the present day was as great as it now is. It came from Germany, and was principally connected with philosophical theories as to the nature of the State, which were really suggested in part by the practice of the Prussian Government in the last century. That Government attempted much towards the welfare of its subjects, and, in fact, very greatly restricted their freedom; and the German philosophers who proposed Socialism were so familiar with the interference of Government in all departments of life that they saw nothing objectionable in its interfering a good deal more. To some extent, too, their advocacy of the system was based on doctrines of political economy, which are now seen to be less likely to be realised than they thought—the doctrines that all value is derived from labour, and the "iron law of wages" (so-called) which we have spoken of in connection with Population.

It is very doubtful, however, if the knowledge and wisdom of any Government is capable of mastering the facts of modern commercial society, at any given time, sufficiently to deal with them satisfactorily; and a mistake would have far more serious consequences even than those of a commercial panic or a period of depression at the present day. Statesmen, too, are not always perfectly free from the suspicion of corruption. For more than a century they have been tolerably free from it in England—but not so everywhere abroad; and had the Government the sole control of the production and distribution of the wealth of the country, there would be immense opportunities for a dishonest set of statesmen to enrich themselves at the public expense. And the temptation might prove too strong. No adequate check would (probably) be possible, because the public at large cannot be sufficiently informed either as to the actual facts of business at a given time, or as to the principles on which skilled business men conduct affairs. The only check would in practice be a check by officials, and officials—in some countries—have all been corrupt together.

Somewhat the same objections apply to the "Nationalisation of the Land," supported by many people who are not Socialists, and best known in connection with the name of Mr. Henry George, of California. As land (as we have said), being limited, tends constantly to become more valuable as other kinds of wealth and population increase, it is thought by some unfair that this increased value should go to the landowners. Consequently it has been proposed to subject all land to a tax equal to the economic rent. Thus, as the landlord would not derive any revenue from his land, he would be ready to make it over to the State. And by various other means land would gradually be got under popular control.

There is, no doubt, in this case also great danger of corrupt management of the land by the Government, whether central or local. It would be so difficult, even if advisable, to make either this change or the more comprehensive changes involved in Socialism, that we need not discuss them further.

EXCHANGE.

Political economy is mainly the science of exchanges. As society advances, owing to the division of labour and the growth of trade, nearly all wealth is produced for the purpose of being exchanged. The exceptions are quite trifling, especially in most of the more advanced countries. We have before explained how the device of metallic money replaces barter of goods for goods and facilitates exchange. And we have said that the quantity of goods of other kinds that can be obtained in exchange for a given quantity of goods is the value of the latter, and that it is convenient to express the former quantity in terms of one kind of goods—metallic money. Value so expressed is called price.

Money in the popular sense ordinarily includes gold, silver, and copper coin; while it would almost always be extended to bank-notes, and even (loosely) to cheques and bills of exchange. But it is clear that these stand on a very different footing from one another. Cheques and bills of exchange are only valuable so long as their holder is sure they are exchangeable for coin. Bank-notes are of no value if the bank fails by which they are issued. Bank of England notes are practically (as well as legally) equivalent to certain amounts of gold coin, because the failure of the Bank of England is too unlikely to be considered. Nor are even silver and copper coin in England "money" in the same sense as gold. Nobody is obliged to receive copper in payment of a debt due to him to the value of more than 1s. or of silver for more than 40s. But he cannot refuse to receive English gold coin or Bank of England notes. The law has selected one metal, and one form of printed promises to pay certain sums of that metal, and declared that they shall be "legal tender" for all payments—that is, if the creditor will not take them, the courts will not help him to get anything else.

In some cases (as in France some years ago) the law has selected *two* metals as well as certain kinds of bank-notes as legal tender—gold and silver; and a similar plan is much advocated for adoption at present in all civilised countries (for reasons we shall deal with hereafter) under the name of Bimetallism.

Now the political economist, in defining money, excludes not only cheques and bills of exchange, but also bank-notes. Clearly their value depends on whether they are likely to be paid or not. If it is certain that they will be paid (as it is with regard to Bank of England notes), they will pass as equivalent to gold. If not, all the legislation in the world will not make them do so. He classes bank-notes under "forms of credit"—which we shall deal with by-and-by.

Moreover, he distinguishes "standard money" and "token money." Standard money consists of the coins made of the metal or metals which the Government have declared shall be legal tender to any amount; while token money consists of the small coins introduced chiefly to facilitate small payments. Thus a gold coin of the value of the two hundred and fortieth part of a sovereign, or even the twentieth part, would be quite an impossible coin to handle, probably even to make; coins of a less precious metal—which originally were of about the same value as that fraction of a gold coin would be—have been introduced to pass as their equivalents. Such coins are made in England of silver and bronze, on the Continent also of an alloy called *billon*. They are known to the economist as "token money," because the value of the metal contained in them may vary with reference to the standard metal, certain quantities of which they represent, and yet they continue to circulate as tokens of those quantities. "Money," in the strict economic sense, is confined to "standard money."

Now it must be carefully understood that the reason why standard money exchanges freely for goods is not due to the action of the Government. The control of the coinage by Government is a matter of convenience, to prevent frauds, to check delay in testing the coin, and to insure that it shall circulate readily. But there is no reason in the nature of things why the work of coinage should not be entirely in private hands. Mr. Herbert Spencer has argued that it ought to be so: the only difficulty is—but it is a very great one—that of insuring that the coins should be what they profess to be. Few people know how to test coin, or could do it in the hurry of trade. But in many countries (as noticed in lesson I.) foreign coin circulates quite as freely as the local coin, sometimes more freely. Spanish silver dollars, though not legal tender in the English West Indies, are said in some of the islands to be the customary standard coin; and in parts of the East and of Africa silver dollars of one kind or another are so. When our troops made an expedition into Abyssinia, in 1867, large quantities of an old-fashioned Austrian coin of the last century, the "Maria Theresa dollar," were specially ordered by our Government from the Austrian mint, because the natives were familiar with that coin, and would take it more readily than any other. While, if a government debases its standard coin, or if it issues paper money which it is not likely to pay for in standard metallic money, the value of such coin or paper at once depreciates compared both with the former standard money and with goods: that is, a paper dollar will purchase less than a gold one.

It must always be remembered then that ***standard money is simply one particular commodity chosen to do the work of exchanging others,*** and guaranteed by the Government stamp to be what it professes to be. Were there any doubt about this guarantee, the value of money would fall. Money is a kind of wealth: not the most important kind, for it is of no use to the owner till he parts with it; but, generally speaking, the most convenient form for small amounts of unused wealth, because it serves as a store for purchasing power over commodities. We say, "for small amounts," because wealth that is not needed for the immediate wants of the owner is more profitably kept in other forms in which it can be directly applied to production, and this is made possible by the modern system of banking and credit. To keep a strong box full of sovereigns (apart from the risk of loss) would clearly be mere waste; they had better be invested, *i.e.*, put into the hands of someone who can be trusted to use the wealth for which they can be exchanged in somehow producing more wealth, and pay the owner a share of the product. Banking helps to effect this in a way we shall presently describe.

Now it is clear that if the amount of standard money in a country were (for instance) suddenly doubled, the amount of other commodities remaining the same, there would be just twice as much money to exchange for the goods, and so prices would be just doubled. If everybody woke up one morning by a miracle with exactly twice as many sovereigns in his possession as when he went to bed, the world would have that amount of extra gold, but would be no richer otherwise. There would be twice as many sovereigns to do the work of exchange, and everything (as soon as matters had settled themselves after this miracle) would exchange for twice as many. But there would be no more goods of other kinds, or fresh possibilities of enjoyment. From this illustration we can easily see that (so long as there is enough money in the country for anyone who wants to exchange goods for it to be able to do so) the quantity of money in the country makes practically no difference to the wealth of its inhabitants, except when we consider foreign trade. In this case it does make this difference—that the money is exported in exchange for goods, just like coal or wheat or any other commodity might be. Otherwise large quantities of specie in a country do not make the country wealthier. Only so much is wanted as will give confidence that the banking reserve will be maintained. Now the "mercantile system" (the policy of European Governments in the last century) made the mistake of trying to get a great quantity of specie into the country and keep it there. The chief result was to raise general prices; people used more coins in buying and selling than they otherwise would have, and dealt with larger sums in making up their accounts. But the country was poorer, not richer, than it would have been otherwise, because the laws necessary to keep up the system prevented the owners of wealth from applying it in the ways in which it would produce most.

Apart from such legal restrictions—which have never yet been effectually maintained—gold and silver tend to be constantly distributed over the world. The sudden discovery of rich gold fields in England would for a short time make gold plentiful here, and prices would rise. But merchants of other nations would at once send in their goods to profit by these high prices, and this would continue till the gold, over and above what we require for our own circulation, was taken out of the country in exchange for fresh goods.

General Rise and Fall of Prices.—The value of a particular thing at a given moment depends on the "relation between demand and supply." And its normal or usual value depends on the normal relation—that is, on the amount of difficulty there is in increasing that kind of thing, or almost always on the cost of production. But now suppose the kind of commodity in which these values are usually estimated—that is, standard money—increases in amount, while the amount of goods and the purchasing power of each over all other goods remain the same. Clearly it will take more standard money to estimate the values—that is, prices will rise. Or if the sum total of goods increases in amount and value, while money remains the same, higher values will be expressed with the same amount of money—that is, prices will fall. Apart, then, from the prices of *particular* things, there may be a rise or fall of general prices, caused by the increase or decrease of money relatively to other goods. Such phenomena have often happened in history. The two most famous cases are the rise when America was discovered, and quantities of gold and silver produced there—and probably much larger quantities which had been stored up there in various forms for centuries—were introduced into Europe; and the discovery of the Australian and Californian gold mines between about 1847 and 1853. Silver, which in the middle ages was the usual standard metal, rose steadily in purchasing power till the discovery of America, about 1500. In the next 150 years it fell to about one-third of its former purchasing power, then it rose again. Gold (according to Professor Jevons) before 1600 was relatively to silver between the proportions of 1 to 10 and 1 to 12—that is, a certain quantity of gold would have from 10 to 12 times the purchasing power of the same quantity (by weight) of silver. About 1650, the proportion was as 1 to 15. For the first seventy years of this century it was as 1 to 15½. Since then, increased production of silver, and the general disuse of silver as a standard metal (because as countries become richer they have to do with larger sums, and it saves a good deal of trouble to pay them with the more precious metal, gold), have caused the ratio to vary very much: it is now between 1 to 21 and 1 to 22. It is true there are not twenty-two shillings to the sovereign, but, as we have explained, the relation of token coin to standard coin is arbitrarily fixed by law, and token coin is used for small purchases.

The discovery of gold in California and Australia sent down the purchasing power of gold very considerably. Professor Jevons has estimated that between 1789 and 1809 it fell 46 per cent.; between 1809 and 1849 it rose 145 per cent.; between 1849 and 1877 it fell 20 per cent.; and it is now alleged to be rising again. Its fall has been due to an increase in the supply, or to a decline in the demand, owing, it may be, to bad trade, perhaps in the first case cited to decrease of circulation owing to the European war; after 1849, to increase in the supply caused by the great gold discoveries. Its rise has been due mainly to increased demand caused by increased trade. After 1849, it would have fallen much more in value, only that the introduction of railways and ocean steam navigation, and the opening up of new countries greatly increased the demand for gold coin, by increasing immensely the number of trading transactions.

APPLIED MECHANICS.—XIV

[*Continued from Vol. VII., p.* 347.]

APPLICATIONS OF THE LAWS OF TENSILE AND SHEAR STRESS AND STRAIN—STRENGTH OF BOILERS AND PIPES—STRENGTH AND STIFFNESS OF SHAFTS—PRACTICAL RULES AND EXAMPLES.

We have referred to tensile and compressive stresses and strains as being *simple;* as a matter of fact, the result produced by either is not so very simple. Thus, if we take a small spherical portion of a wire, it will when the wire is subjected to tension assume the shape of an ellipsoid, each dimension in the direction of the stress being lengthened by a certain fraction of its former length, and all dimensions in directions at right angles to this being shortened by a *much smaller* fraction of their old lengths. Thus, in Fig. 81 a section of such a little portion before and after strain is shown. Any ordinate A B of the sphere becomes A′ B′, or elongates A′ B′—A B, and this elongation divided by A B is the tensile strain. It comes to the same amount for any ordinate in this direction.

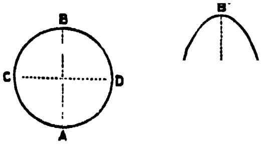


Fig. 81.

The fractional lateral contraction or strain is $\frac{\text{C D} - \text{C}' \text{D}'}{\text{C D}}$. Suppose the tensile stress to be 1 lb. per square inch, then $\frac{\text{I}}{\text{E}}$ is the strain. The reciprocal of Young's modulus is generally denoted by the letter *a*.

The *lateral* strain corresponding to the longitudinal strain *a*, or stress of 1 lb. per square inch, is usually denoted by the letter *b*.

The connection between the different moduli to which we have referred may be stated as follows:—

$$\text{E} = \frac{1}{a},$$

$$\text{N} = \frac{1}{2(a+b)},$$

$$\text{and} \quad \text{K} = \frac{1}{3(a-2b)}.$$

These statements we have not space to prove, but the reader is referred to the writings of such authorities as Professors Thomson and Tait or Perry for the proofs.

APPLICATION OF THE LAWS OF TENSILE STRESS.

A very interesting application of the laws already given for tensile stress is that which enables us to calculate the strength of a vessel, such as a boiler or pipe, subjected to fluid-pressure inside. Evidently the material is in such a case subjected to tension; and if we assume the thickness of the metal to be small in comparison to the diameter of the vessel, it may be supposed that the stress is fairly uniformly distributed across a section of the material. In order to deduce a general law, we may take any shape of vessel whatsoever; that shown in Fig. 82 will do. Imagine the pressure of the fluid inside to be *p* lb. per square inch; then, since the fluid is at rest, it will press *normally* on the confining surface everywhere. To find the strength of the shell

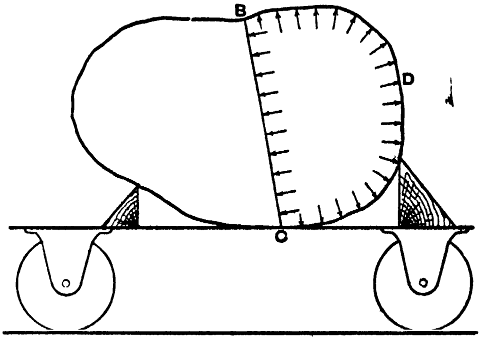


Fig. 82.

of the vessel to resist bursting at any plane D C, we may imagine the vessel resting on a waggon with infinitely well-oiled wheels, and a smooth road. If we imagine a closely fitting door to be placed across the vessel at B C, it will not alter the equilibrium of the forces inside. Now imagine the vessel cut completely through just to the left of B C, and the left-hand portion of the vessel removed; the remaining part will not tend to move. This will readily be conceded on a little consideration. It is evident, then, that the total force on B C to the left must balance the total force on B D C in the opposite direction.

Let the area of the door B C be A square inches, then the total force on it (at right angles to its surface) is Ap lb., which must be the amount of the total force acting in the opposite sense on the irregular surface B D C. Hence, we have obtained the total force tending to *produce* bursting at the section B C; it is the area of the vessel in that plane in square inches multiplied by the fluid-pressure in lb. per square inch; and our conception of a door is no longer necessary, as it only helped us to obtain the total resultant force to the right on the irregular surface B D C.

What is the total force *resisting* bursting? Let a square inches be the area of metal which would be laid bare by fracture at the plane B C, and f_t the ultimate tensile stress of the metal; then the total force resisting bursting is $a \times f_t$ lb. These total forces must balance each other, or

$$Ap = a f_t,$$

which is the general law for the strength of a thin shell subjected to fluid-pressure inside.

The strength of any such vessel, then, is calculated from the rule—

The area of the vessel in the plane of fracture in square inches, multiplied by the pressure of the fluid in pounds per square inch, is equal to the area of the metal which would be laid bare by fracture in that plane multiplied by the greatest stress the material will stand in pounds per square inch.

If we want the vessel to resist the pressure *safely*, we must use *safe* instead of ultimate stress in this rule. It is easy now to apply our rule to one or two practical cases, such, for instance, as calculating the strength of a boiler or a large thin pipe. In the case of a boiler, the additional strength due to the ends will be neglected.

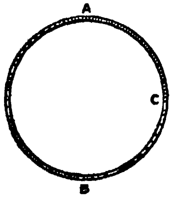


Fig. 83.

First of all, suppose the boiler to burst *longitudinally—i.e.*, one end of the boiler to be blown away from the other—leaving the fractured metal bare at such a section as A C B (Fig. 83). Let the boiler be d inches in diameter, and the shell t inches thick; then the area of the vessel in the plane A C B is $\frac{\pi}{4}d^2$, and the area of metal in the same plane πdt square inches. If p is the pressure of the steam or other fluid inside in lb. per square inch, and f the ultimate or safe tensile stress of the metal, according as the pressure of the fluid is to be that of bursting or safety, our general rule becomes—

$$\frac{\pi}{4}d^2 = \pi dtf,$$
$$\text{or} \quad pd = 4tf;$$

or the pressure the boiler will stand is

$$p = \frac{4tf}{d}.$$

Now consider the strength of the boiler to resist bursting *laterally—i.e.*, bursting in which the top of the boiler is blown off. Let the boiler be l inches long; hence the area of the vessel is in this case ld square inches, and if the ends are neglected the area of the metal is $2lt$ square inches, the strength rule becoming—

$$ldp = 2ltf,$$
$$\text{or} \quad pd = 2tf.$$

The pressure the boiler is capable of standing when its strength in this direction is considered is

$$p = \frac{2tf}{d}.$$

It will be observed that this is only half the pressure the boiler will stand before it bursts longitudinally; hence, it will burst laterally, and we will never have the chance of testing the accuracy of the other rule. At any *inclined* section the strength is something between the two, but the latter is the rule to be employed, as it gives the strength of the boiler at its *weakest* section, which is what we want.

For a spherical boiler the most likely plane in which bursting will take place is a diametral plane, its area being $\frac{\pi}{4}d^2$ square inches; the area of fractured metal is πdt square inches, and the strength rule is

$$\frac{\pi}{4}d^2p = \pi dtf,$$
$$\text{or} \quad pd = 4tf,$$

the same as for a cylindric boiler bursting at a section at right angles to its axis. In these rules the weakness introduced into the shell by the riveting of the joints is not considered. These seams weaken the shell to a certain extent, and the result is much the same as if the safe stress of the metal were reduced in a certain ratio.

The rules just given may be used for finding the strength of pipes if the pipes are very large in comparison to their thickness. Such pipes are usually of cast-iron; and as it is very difficult to ensure that a cast-iron pipe shall be of exactly the same thickness of metal, it is usual to add to the thickness obtained by this rule a certain amount which is determined mainly from experience.

In a section of *thick* pipes or cylinders, the stress is not uniformly distributed across a section from the inside to the outside of the pipe, and the question of the strength of such a section is rather complicated. Perhaps the best rule for the strength of such pipes is the following—

$$p(D^2 + d^2) = f(D^2 - d^2),$$

where D is the external and d the internal diameter of the pipe in inches, p and f having the same meanings as before.

EXAMPLES.

1. A cylindric vessel is 6 feet in diameter, and the metal is ⅝ inch thick; find the greatest fluid-pressure it will bear inside, the safe tensile stress of the metal being 10400 lb. per square inch.

Answer, 180·5 lb. per square inch.

2. If the greatest safe steam pressure in a cylindric boiler, 6 feet 6 inches in diameter, is to be 120 lb. per square inch, and the strength of the riveted joints ·58 of that of the plates of which the boiler is made, the safe stress of the plates being 5 tons per square inch—find the proper thickness of metal.

Answer, ·72 inch.

3. Using the rule for boilers, find the "head" of water which will be borne by water-mains 4 feet in diameter and 1 inch thick, the safe stress of the metal being 3000 lb. per square inch, and ⅛ inch being deducted for want of concentricity in casting.

Rule.—"Head" in feet ÷ 2·3 = pressure of water in lb. per square inch. The term "head" means the vertical height of the surface of the water in the reservoir above the level of the pipe.

Answer, 251·6 feet.

4. Find the bursting-pressure of a spherical boiler 6 feet in diameter, the thickness of metal being ½ inch, and the ultimate stress of the metal 50700 lb. per square inch; it being supposed that the joints diminish the strength of the shell 25 per cent. Answer, 1056 lb. per square inch.

5. In hydraulic mains the pressure of the water is 700 lb. per square inch, the safe tensile stress of the metal 3000 lb. per square inch, and the internal diameter of the pipes 6 inches; find the proper thickness of metal, using the rule for *thick* cylinders.

Answer, 0·8 inch.

STRENGTH OF SHAFTS.

When a shaft transmits power it is twisted; in fact, if a straight line be drawn on the shaft parallel to its axis when the shaft is unstrained, this line becomes a spiral when the shaft transmits power. If we imagine the shaft to be twisted ***only***, or subjected only to torsion, the strain is shearing; and the student may, by constructing a little shaft of pennies and then turning each of them relatively to the next, get an idea of what takes place in a shaft. In Fig. 84 a short portion of a shaft is shown, and we may consider what happens to it when twisted, first of all considering a little column in it the two ends of which are in two sections, unit distance apart. Since we are concerned only with *relative* motion, we may suppose the end of the column in the left-hand section to remain fixed, the other end moving round in the arc of a circle, about o as centre, under the action of the torque applied to the shaft.

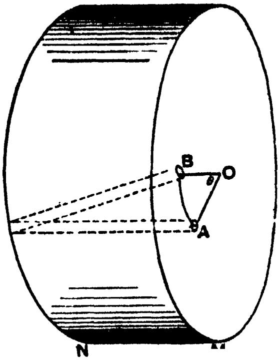


Fig. 84.

The angle moved through relatively to o is the angle A o B $= \theta$ radians, say. Let the end of the little column be a square inches in area (a being an exceedingly small fraction); then, if f is the safe shear stress of the material, fa is the greatest tangential force we may suppose permissible on the end of the little column. The moment of this force about the centre of the shaft is $fa \times r$, where r is the radius Ao or oB of the path described by a; and the sum of all such products as this, for all the little columns into which we can conceive the shaft to be divided, is equal to the total torque applied to the shaft.

The applied twisting-moment, or torque, we may denote by M_t. We have at once therefore the law—

$$(1)\ M_t = \Sigma far.$$

The distance moved by the end of the little column is $AB = r\theta$, and shear strain is

$$\frac{\text{Distance moved}}{\text{Distance from fixed place}} = \frac{r\theta}{1}.$$

Hooke's law tells us that—

$$\text{Shear stress} = N \times \text{shear strain}.$$
$$\therefore\ \text{Shear stress} = Nr\theta.$$

We have represented shear stress by f in equation (1) above, but we can now put for f its value $Nr\theta$, which gives us—

$$M_t = \Sigma Nr\theta a \times r$$
$$= \Sigma Na\theta r^2:$$

An expression similar to Σar^2 has been already explained. It is the moment of inertia of the section about the axis from which r is measured. Hence—

$$(2)\quad M_t = N\theta I,$$

which is the law for the stiffness of a shaft: I for a circle (which is the shape of the section in this case, and in the case of most shafts) about a line through its centre perpendicular to its plane is $\frac{\pi d^4}{32}$, d being the diameter of the circle.

The law, therefore, becomes—

$$(2a)\quad \theta = \frac{32M_t}{\pi N d^4},$$

which will be best understood if read as follows:—*The angle of twist in unit length of a cylindric shaft of diameter d inches, when subjected to a twisting moment of* M_t *pound-inches, is equal to* 32 *times the twisting moment divided by the product of* π, *the fourth power of the diameter and the modulus of rigidity of the material.*

For hollow cylindric shafts $I = \frac{\pi}{32}(D^4 - d^4)$; hence, the rule becomes, for such a shaft—

$$\theta = \frac{32M_t}{\pi N(D^4 - d^4)},$$

D being the external and d the internal diameter.

The rule for the strength of a shaft is now easily obtained. We saw that the greatest shear stress on our little column is $Nr\theta$, or $f_s = Nr\theta$, where f_s is the proof or safe shear stress of the material, as required. This may be written $N\frac{d}{2}\theta = f_s$. Put into this for θ, its value as given in equation (2a), and we have—

$$N\frac{d}{2} \times \frac{32M_t}{\pi N d^4} = f_s,$$

from which—

$$(3)\quad M_t = \frac{\pi d^3}{16}f_s,$$

which is the rule for the *strength* of a solid cylindric shaft subjected to torsion only.

In hollow shafts it becomes—

$$M_t = \frac{\pi(D^4 - d^4)}{16D}f_s,$$

which means that a *solid cylindric shaft, d inches in diameter, will stand a torque of* M_t *pound-inches,* M_t *being of the numerical amount obtained by multiplying* π, *the third power of the diameter, and the proper shear stress of the material together, and dividing the product by* 16.

These rules cannot, however, be assumed to hold for stresses which exceed the elastic stress of the material.

From this it is not difficult to deduce a practical rule for the diameter of a shaft which will safely transmit a given horse-power at a given speed. We have already seen (p. 150) that if a torque of T pound-feet acts on a shaft revolving n times per minute, the horse-power transmitted is given by the rule:—

$$HP = \frac{T \times 2\pi n}{33000},\ \text{whence}\ T = \frac{33000\ HP}{2\pi n}.$$

In this lesson we have used the symbol M_t to represent torque, or twisting moment, in *pound-inches;* hence,

$$T = \frac{M_t}{12},\ \text{or}\ 12 \times T = M_t.$$

Putting this value of M_t into rule (3), and taking 9000 lb. per square inch as the safe shear stress of a wrought-iron shaft, we have—

$$\frac{12 \times 33000 \times HP}{2\pi n} = \frac{\pi d^3 \times 9000}{16};$$

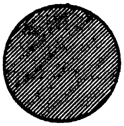
from which

$$d^3 = \frac{12 \times 33000 \times 16}{2 \times 3\cdot1416^2 \times 9000} \times \frac{HP}{n},\quad \text{or}\ d = 3\cdot29\sqrt[3]{\frac{HP}{n}},$$

which may be taken as—

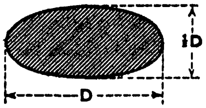
$$d = 3\cdot3\sqrt[3]{\frac{HP}{n}}.$$

This is a very important practical rule. Taking the safe-working shear stresses of cast-iron and steel shafts to be respectively 4500 and 12000 lb. per square inch, we get the coefficients 4·1 and 3, instead of 3·3 for the rule just given, when that rule is applied to those materials. Remember these rules assume that the shaft is twisted *only.*



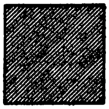
1·0

Fig. 85.



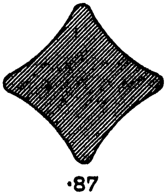
·80

Fig. 86.



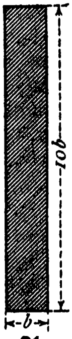
·88

Fig. 87.



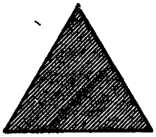
·87

Fig 88.



·21

Fig 89.



·73

Fig. 90.

In the foregoing we have dealt only with cylindric shafts. If a right section of the shaft is *not* circular, the theory on which these calculations are based does not hold; in fact, a section which was plane before twisting occurred, no longer remains plane after strain, except in the case of a circular section. For other shapes of section the theory is much too difficult for an article like the present. The subject has been investigated by M. de St. Venant, and the results of his investigation are given in the article on Elasticity in the *Encyclopædia Britannica*. It is found * that sections have the relative values for resisting torsion shown by the numbers in Figs. 85, 86, 87, 88, 89, and 90, the sections being all of the same area, and the value of the circular section being taken as unity.

Sir William Thomson has given a beautiful hydrodynamic illustration of the way in which the stress varies at various points on the boundary of a section. If we imagine a thin box made of the exact shape of the shaft, and filled with a frictionless fluid, then if the box is suddenly rotated about its axis, the *velocity of the fluid relative to the box at any point represents the shear stress in a shaft of a similar shape when twisted.*

In most non-circular sections, it will be seen from this rule that the stress at any point on the surface of the shaft is greatest nearest the centre.

EXPERIMENTAL ILLUSTRATION OF THE LAWS OF TORSION.

The laws of the strength and stiffness of cylindric shafts or wires may be illustrated in the following way:—In Fig. 91 a wire is represented as gripped in a vice at A, and twisted by equal parallel and opposite forces (*i.e*, a true couple) applied to the pulley at B. Pointers are fastened to the wire at C, H, and G, so that the distances C H and H G are equal. The illustration will be better if the wire is longer than here represented, and if more pointers are used By applying different twisting moments to a wire, it is found that for any given length of wire the *angle of twist is proportional to the twisting moment.* By using wires of different diameters, but of the same material, and applying the same twisting moments to all, it is found that the *angle of twist is inversely proportional to the fourth power of the diameter* of the wire; and if the material *only* varies, the *angle of twist is inversely proportional to the modulus of rigidity of the stuff.*

In the first part of the experiment—or, indeed, in any of the three parts—it is easily seen that the *angle of twist produced by any twisting moment is proportional to the length of wire considered.*

Combining these results, we have the experimental law that $\theta \propto \frac{M_t l}{N d^4}$; and it will be seen that this rule agrees with that deduced from theoretical considerations, and given in equation (2*a*).

If wires of different diameters, but the same in other respects, are tried, it will be found that the twisting moments necessary to produce permanent set are *proportional to the cubes of the diameters* of the wires. This is an illustration of the strength rule given in equation (3).

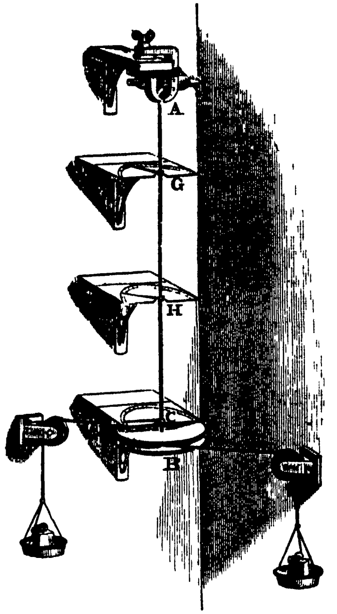


Fig. 91.

If wires of other than circular section are tried, it will be interesting to note where the material first begins to give way. This is a useful experiment, and not only illustrates the theoretic laws, but shows that those laws—as they ought to do—apply equally to thin wires or to large shafts.

PRACTICAL CONCLUSIONS AND EXAMPLES.

From what has been given you are now in a position to work out useful examples on the strength and stiffness of shafts *subjected only to twisting.* It should be borne in mind, however, that shafts in practice are subjected to *bending* as well as twisting, owing to the loads due to the weights of pulleys and pulls of belts.

Space does not permit us to go into this matter fully, but we may give the result, which is that the diameter of the shaft has to be *increased* by an amount depending on the amount of bending which the shaft has to withstand.

Thus, if the practical rule for the diameter of a wrought-iron shaft is $d = 3\cdot3\sqrt[3]{\frac{HP}{n}}$ when torsion only is considered; it will be $d = c \times 3{\cdot}3 \sqrt[3]{\frac{\text{HP}}{n}}$ when bending is taken into account. Some values of *c* are given below:—

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* "Proceedings, Inst. C.E., 1890," Part III. p. 276.

Kind of Shaft.	Value of c.
Propeller-shafts of steamships, and shafts with similar load	1·18
Line-shafting in mills, etc.	1·3
Crank-shafts and shafting subjected to shocks, such as shafts in some machine-tools, etc. .	1·42

If, then, you wish to take bending into account, instead of using the rule—

$$d = a\sqrt[3]{\frac{\text{HP}}{n}}, \quad \text{where } a = 3{\cdot}3,\ 4{\cdot}1, \text{ etc.},$$

take the rule—

$$d = c \times a\sqrt[3]{\frac{\text{HP}}{n}}.$$

Thus, if a shaft is required for a mill or factory, if not subjected to excessive shocks or more than the usual amount of bending, its diameter (if it is of wrought-iron) would be found from the rule—

$$d = 1{\cdot}3 \times 3{\cdot}3\sqrt[3]{\frac{\text{HP}}{n}}.$$

The following examples should be gone through carefully:—

Numerical Examples.

In the following examples the shaft is supposed to be subjected only to torsion.

1. Find the safe diameter of a wrought-iron shaft to transmit 60 horse-power at 120 revolutions per minute.

The rule is $d = 3{\cdot}3\sqrt[3]{\frac{\text{HP}}{n}} = 3{\cdot}3 \times \sqrt[3]{\frac{60}{120}}$ in this case,

$$= 3{\cdot}3 \times \frac{1}{\sqrt[3]{2}} = \frac{3{\cdot}3}{1{\cdot}26} = 2{\cdot}62 \text{ inches.}$$

2. A wrought-iron shaft 3 inches in diameter rotates 150 times per minute; what horse-power will it transmit with safety?

Since $d = 3{\cdot}3\sqrt[3]{\frac{\text{HP}}{n}},\ \frac{d}{3{\cdot}3} = \sqrt[3]{\frac{\text{HP}}{n}}$ or $\frac{d^3}{(3{\cdot}3)^3} \times n = \text{HP}$;

from which the horse-power in this case is—

$$\frac{27 \times 150}{35\ 937} = 112{\cdot}7.$$

3. If a shaft transmits safely 100 horse-power at the speed of 150 revolutions per minute, what power will it transmit with safety at 200 revolutions per minute? Answer, 133⅓ horse-power.

4. Find the twisting moment necessary to produce, in a wrought-iron shaft 1½ inch in diameter and 12 feet long, a twist of 12 degrees.

If this shaft revolves 150 times per minute, what horse-power will produce the same twist? $\text{N} = 10500000$.

A twist of 12° in 12 feet is a twist of $\frac{1}{12}$° in 1 inch, or $\frac{1}{12} \times {\cdot}0175$* radian in 1 inch.

The rule for the stiffness of a shaft is

$$\theta = \frac{32\text{M}}{\pi \text{N} d^4}$$

whence, in this case, since $\theta = {\cdot}00146$,

$$\text{M}_t = \frac{{\cdot}00146 \times 3\ 1416 \times (1{\cdot}5)^4 \times 10500000}{32}$$

$$= 7619 \text{ pound-inches.}$$

The second part of the question is solved by the rule—

Torque (in lb.-ft.) × angular velocity in radians per minute ÷ 33000 = horse-power.

Answer, 18·03 horse-power.

5. Will the twisting moment found in the last example be too great for the shaft to transmit with safety, the safe shear stress being taken as 9000 lb. per square inch? Answer, Yes.

6. A solid cylindric shaft is 5 inches in diameter; find the external diameter of a hollow shaft of the same material, the internal diameter of which is two-thirds of its external diameter, and which shall have (*a*) the same *strength*, (*b*) the same *stiffness*, as the solid shaft.

By equating the expressions for the strengths of a hollow and a solid shaft, we get—

$$\frac{\text{D}^4 - d^4}{\text{D}} = \delta^3;$$

where D and *d* are respectively the external and internal diameters of the hollow shaft, δ being the diameter of the solid one.

The rules for stiffness give us the condition—

$$\text{D}^4 - d^4 = \delta^4.$$

Answer (*a*), D = 5·38 inches.
,, (*b*), D = 5·28 inches.

In solving the following examples, the rules which allow for bending as well as twisting are to be taken.

1. Find the diameter of a wrought-iron mill-shaft, to transmit 250 horse-power at 200 revolutions per minute. Answer, diameter 4·62 inches.

2. A wrought-iron crank-shaft is 6 inches in diameter, and rotates 96 times per minute; what horse-power will it transmit safely? Answer, 201·6 horse-power.

3. Find the diameter of a solid steel propeller

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* The number of degrees in any angle × $\frac{\pi}{180}$ (which is approximately ·0175) gives the number of radians in the angle.

shaft to transmit 12000 horse-power at 80 revolutions per minute. Answer, diameter 18 inches.

4. If the shaft in the last example is to be hollow, find its external diameter from *strength* considerations—(*a*) when its internal diameter is three-fourths of its external diameter, (*b*) when its internal diameter is two-thirds of its external diameter.

Note. — For hollow steel shafts subjected to torsion only, the strength rule simplifies to $\frac{\text{HP}}{n} \times 26{\cdot}5 = \frac{\text{D}^4 - d^4}{\text{D}}$. For wrought-iron shafts, use 35·66 instead of 26·5. If bending is taken into account, multiply the horse-power by c^3.

Answer (*a*), $\text{D} = 20$ inches.
„ (*b*), $\text{D} = 19{\cdot}26$ inches.

5. A steel shaft in a certain machine-tool has to transmit 10 horse-power at 100 revolutions per minute; find its proper diameter.

Answer, 1·97 inch.

MINERALOGY.—V.

[*Continued from Vol. VII., p. 356.*]

DESCRIPTIVE MINERALOGY. CHLORIDES, ETC., OXIDES, OXYGEN SALTS.

3. CHLORIDES, FLUORIDES, ETC.

ROCK-SALT, or halite ($NaCl$), sodium chloride, is soluble in water, decrepitates, and burns with a yellow flame. It crystallises in the Cubic system, in cubes or in hollow "hopper-shaped" crystals. It is transparent, very perfectly diathermous, and vitreous. $\mu = 1{\cdot}49$. In colour it varies very much, being colourless when pure, but usually reddish or orange, from the presence of iron, violet, or blue. Its taste is saline. $H = 2$. $G = 2{\cdot}2$. It occurs in beds of various geological age and often of great thickness, associated with gypsum; and on the shores of inland seas. Cheshire, Droitwich in Worcestershire, Wielicza in Austrian Poland, and Stassfurt in Saxony are among the chief localities.

SYLVINE (KCl), the corresponding potassium salt, is isomorphous with rock-salt, differing mainly in giving a violet flame and having a rather bitter taste.

CERARGYRITE ($AgCl$), **EMBOLITE** ($3AgCl + 2AgBr$), and some related compounds are known as *horn silver*, from their pearl-grey colour and resinous lustre. Though crystallising in the Cubic system, they are more often massive. $H = 1 - 2$. $G = 5{\cdot}5 - 6$. They are worked as important silver ores in Chili and Mexico.

FLUOR (CaF_2), calcium fluoride, is the Blue John or Derbyshire spar of miners. It decrepitates, phosphoresces, and with microcosmic salt or sulphuric acid gives off fumes of hydrofluoric acid (HF), which etch glass. It crystallises in cubes, and is transparent, vitreous, and fluorescent. $\mu = 1{\cdot}436$. In colour, though most commonly violet or green, it may be colourless, yellow, or red. $H = 4$. $G = 3 - 3{\cdot}1$. It is a common veinstone, associated with galena, in the smelting of which it was formerly used as a flux, whence its name. It is also used for ornamental purposes and for etching glass.

CRYOLITE ($3NaF + AlF_3$), the double fluoride of sodium and aluminium, derives its name, which signifies "ice-stone," from its white colour and extreme fusibility. It melts in a candle flame, colouring it yellow; becomes blue on the addition of cobalt nitrate; and with sulphuric acid gives off hydrofluoric acid. It crystallises in the Prismatic system, but is usually laminated. $H = 2{\cdot}5$. $G = 3$. It occurs at Arksut-fiord in West Greenland in a vein in gneiss, and was until lately the sole commercial source of the metal aluminium.

4. OXIDES.

CUPRITE, or ruby copper (Cu_2O), an important ore, is fusible, giving a green flame and a copper bead in R.F., and dissolves with effervescence in nitric acid. It crystallises in the Cubic system, often in octahedra, is translucent, adamantine, cochineal-red, blackening on exposure, and brittle. $H = 3{\cdot}5 - 4$. $G = 6$. It occurs in Cornwall; at Chessy, near Lyons; in Chili, Peru, etc.

SPINEL ($MgOAl_2O_3$), a species including some precious stones, is infusible, but is soluble in strong sulphuric acid. It crystallises in the Cubic system, generally in octahedra, and is vitreous. $H = 7{\cdot}5 - 8$. $G = 3{\cdot}5 - 3{\cdot}9$. The red variety is the *ruby*, or *spinel ruby*, of watchmakers; the rose-coloured, the *balas ruby*; the orange, the *rubicelle*; the violet, the *almandine ruby*; the black, *pleonaste*.

MAGNETITE, or lodestone ($FeOFe_2O_3$), the richest and most valuable ore of iron, of which it contains 72 per cent., though usually in amorphous masses, is isomorphous with spinel, occurring in octahedra, often large and very regular. It is metallic and black, with a black streak, and is very magnetic. $H = 5{\cdot}5 - 6{\cdot}5$. $G = 5$. It fuses with difficulty, gives a bottle-green borax-bead in R.F., and is soluble in hydrochloric acid. It occurs associated with the crystalline schists in Norway, Sweden, Lapland, and Siberia.

CHROMITE, the corresponding oxide of chromium and iron ($FeOCr_2O_3$), which is also isomorphous, is the chief source of the chromium salts which are extensively used as pigments.

PITCHBLENDE (UOU_2O_3), the oxide and chief source of uranium, which is used in staining glass of a yellow or black colour, is named from its black colour and pitch-like lustre. H = 5·5. G = 6·5. It occurs at Joachimsthal, Bohemia, and elsewhere.

CHRYSOBERYL ($BeOAl_2O_3$), the oxide of beryllium and aluminium, a species including the gems *oriental chrysolite* (greenish-yellow), *alexandrite* (green by day, red by lamp-light), and *cymophane* (chatoyant), crystallises in the Prismatic system, often in six-sided and stellate twins. It is very infusible and unaffected by acids. H = 8·5. G = 3·7.

CORUNDUM (Al_2O_3), alumina, or aluminium sesqui-oxide, gives a colourless borax-bead, becoming blue with cobalt-nitrate, and is unaffected by acids. It crystallises, as do most anhydrous sesqui-oxides, in the Hexagonal system. It is transparent or opaque, and vitreous. $\mu = 1{\cdot}76$. H = 9. G = 4. The pure colourless variety is the *lux* or *water sapphire;* that exhibiting a six-rayed opalescent star in the direction of the morphological axis is the *asteria* or *star sapphire;* the blue, the *sapphire;* the red, the true or *oriental ruby;* the violet, the *oriental amethyst;* green, *oriental emerald;* yellow, *oriental topaz;* brown and opaque, *corundum;* black, *emery.* The term "oriental," distinguishing these stones from spinel, amethystine quartz, beryl, and ordinary topaz, now only implies excellence and not place of origin. Sapphires come mainly from Ceylon; rubies, from Burma; corundum, used for polishing, from Ceylon and Canton; emery, similarly employed, from Naxos and Asia Minor. The sapphires of various colours are the most costly of gems.

HÆMATITE (Fe_2O_3), a valuable iron-ore, gives a green borax-bead in R.F., and is slowly soluble in warm hydrochloric acid. It crystallises in the Hexagonal system, crystals with splendent metallic lustre, such as occur in Elba, being known as *specular iron-ore* from having been used by the Romans as hand-mirrors. It is often in reniform, mammillated, or botryoid masses, with a radiate, fibrous structure, known as *kidney iron-ore*, or may occur as a red earth known as *red ochre* or *reddle.* Hæmatite is metallic and black ($\mu = 3$), but has a cherry-red streak and appears red in very thin slices. It is slightly magnetic and a conductor. H = 6, G = 5·2. It occurs in hollows in the Carboniferous Limestone, at Ulverston in Lancashire; in vast masses in Missouri, and near Lake Superior and elsewhere.

ILMENITE ($FeOTiO_2 + Fe_2O_3$), or menaccanite, an oxide of iron and titanium, with crystalline form and angles almost identical with hæmatite, occurs in scales and as sand, and in eruptive and metamorphic rocks in the Ilmen Mountains in Orenburg, at Menaccan in Cornwall, and elsewhere.

The hydrated sesqui-oxides of iron include **GÖTHITE** ($Fe_2O_3 + H_2O$), named after the poet Goethe, who was also a mineralogist, which occurs in yellow, red, or brown crystals belonging to the Prismatic system, and the earthy **TURGITE** ($2Fe_2O_3 + H_2O$), a red ochre, **LIMONITE** ($2Fe_2O_3 + 3H_2O$) or brown hæmatite, often a brown ochre, and **LIMNITE** ($Fe_2O_3 + 3H_2O$), a yellow ochre. These three contain about 5, 15, and 25 per cent. of water respectively.

BEAUXITE, or Bauxite, named from a place near Arles in France, is a hydrous oxide of aluminium and iron ($3Al_2O_3 + Fe_2O_3 + 2H_2O$), and is used in the manufacture of aluminium.

PSILOMELANE, named from ψιλός, *psilŏs*, smooth, and μέλας, *mĕlas*, black, is an earthy mineral containing from 70 to 80 per cent. of oxides of manganese, sometimes as much as 17 per cent. of barium oxide, and as much as 6 per cent. of water. It is a common ore of manganese. H = 5 – 6. G = 3·7 – 4·7. **WAD**, named from its wadding-like forms, is a more hydrated substance.

PYROLUSITE (MnO_2), the most important ore of manganese, of which it is commonly termed the "black oxide," is the first of the dioxide series. It gives a violet borax-bead in O.F., and is soluble in hydrochloric acid, liberating chlorine. It crystallises in the Prismatic system, but is generally amorphous or dendritic. H = 2 – 2·5. G = 4·8. Its name is derived from πῦρ, *pūr*, fire, and λύω, *luo*, I wash, because it can take the brown and green tints out of glass. It is mainly used to procure chlorine for bleaching purposes. This ore is extensively worked in Thuringia and Prussia, and also in Devonshire, Somersetshire, and Aberdeenshire.

CASSITERITE, or tinstone (SnO_2), is practically the sole source of tin. It is fusible with soda in R.F., but is unaffected by acids. It crystallises in the Pyramidal system in right square prisms with pyramidal ends, and in many twin-forms. It is adamantine, black or brown, and brittle. Tinstone has been mined in Cornwall for ages. The great mariners of the ancient world—the Phœnicians—dared to pass the Pillars of Hercules, and come to Britain for this ore. It is found in small quantities in Saxony, Austria, and Finland; but in Tasmania, the Malay peninsula and archipelago there are extensive deposits. The island of Banca is almost wholly composed of it. When a district in which tinstone occurs is eroded by a stream, the water acts upon the ore as upon rocks, wearing down small pieces of it, which are found in the bed of the stream, like gravel, and are called *stream-tin.* H = 6 – 7. G = 6·5 – 7·1.

ZIRCON ($ZrO_2 + SiO_2$), the dioxide of zirconium and silicon, is isomorphous with cassiterite, but rarely twinned. It is colourless or yellowish, the clear specimens being the gems known as *jargoon.* H = 7·5. G = 4·7.

Rutile, Anatase, and **Brookite** are identical in composition, being all titanium-dioxide (TiO_2); but rutile is Pyramidal, often acicular and penetrating quartz, has a hardness of 6 – 6·5 and a density of 4·2, whilst anatase crystallises in a distinct series of forms of the same system, has H = 5·5 – 6 and G = 3·8 – 3·9, and brookite is Prismatic with H = 5·5 – 6 and G = 3·8 – 4·2. These minerals, therefore, form an interesting example of polymorphism.

Last and perhaps most important of the oxides are those of silicon, especially **Quartz** (SiO_2). These, however, being important rock-forming minerals, have been sufficiently described in our lessons on Geology (Vol. III., pp. 100, 175).

5. Oxygen Salts.

I. *Carbonates.*

So too the chief carbonates, **Calcite**, **Aragonite**, **Dolomite**, and **Chalybite**, have been already described (Vol. III., p. 178). Besides these must be mentioned the Rhombohedral **Calamine** ($ZnCO_3$), one of the chief ores of zinc; and the Prismatic **Cerussite** ($PbCO_3$), or white lead ore, a decomposition-product of galena. **Witherite** ($BaCO_3$) and **Strontianite** ($SrCO_3$), both used in refining sugar, from their high specific gravities of 4·3 and 3·5, were formerly confused with the sulphates of barium and strontium under the name "heavy spar." **Malachite**, generally in stalagmitic forms, is the green carbonate and hydrate of copper ($CuCO_3 + CuH_2O_2$); and **Azurite** or **Chessylite** ($2CuCO_3 + CuH_2O_2$) is a deep blue mineral, often associated with it.

II. *Silicates.*

By far the most varied and complex group of minerals is that of the silicates. Their chemical composition can often not be expressed in a formula, or, if so expressible, only by one which the student can hardly be expected to carry in his memory. Beyond their purely scientific interest most of the species, partly from their infusibility, are more important as constituents of the crystalline rocks than for uses in the arts. In elementary lessons such as these we can, therefore, only briefly supplement what we have already said of them (Vol. III., pp. 177–8) by some notes, chiefly on those valued as gems.

Olivine, when yellowish-green, is known as *chrysolite*, and when pistachio-green, as *peridot.*

Asbestos is hornblende in slender fibres, which are easily separable. Usually it is white, but occasionally green. It is noted for its resistance to fire, and is used in gas stoves for the flame to play against. It may be woven into fabric, which is sometimes used as a covering where fire is to be resisted. *Mountain leather* and *mountain cork* are but varieties of the same material. It would seem that the main difference between augite and hornblende results from the manner of the cooling of the rock. Speaking generally, hornblende is a constituent of the older igneous rocks, and augite of the more modern.

Crocidolite, a silicate of iron and sodium, the fibres of which are enclosed in the green quartz "cats-eyes" of South Africa, and the tough non-crystalline green substance **Jade**, a silicate of magnesium and calcium, with S.G. = 2·9 or 3, used from prehistoric times for ceremonial weapons, are related to the augites and hornblendes.

Topaz is a silicate of aluminium, related to andalusite, but containing 15 to 17 per cent. of fluorine. It crystallises in the Prismatic system with perfect basal cleavage, and is generally hemihedral and pyro-electric. H = 8. G = 3·5. The yellow crystals from Brazil become pink when heated. It is used as a substitute for emery and as a gem; but yellow sapphires are known as *oriental topaz*, and yellow quartz as *false topaz.*

Staurolite, which occurs in the spotted schists, is named from its cruciform macles, which belong to the Prismatic system. It differs from andalusite in containing silicate of iron, and is often dark-coloured.

Kyanite, identical in composition with andalusite ($Al_2O_3SiO_2$), and occurring in the same way, differs in its long anorthic crystals, and is often light blue.

Dichroite, a silicate of aluminium, magnesium, and iron, the *iolite* or *saphir d'eau* of jewellers, is also Prismatic and blue, but dichroic.

Carbuncle is simply a jeweller's name for a dark-red garnet cut *en cabochon*, *i.e.*, rounded, without facets.

Related in composition to the felspars are leucite and nepheline, often important ingredients of rocks.

Leucite, a potassium-aluminium silicate, occurs in regular icositetrahedra, often large, and white or grey, which are now known to be Pyramidal at ordinary temperatures, but to become Cubic when heated. Showers of them are thrown out by volcanoes.

Nepheline, named from its clouded appearance in nitric acid, is a Hexagonal aluminium, sodium, and potassium silicate, characteristic of phonolite.

Beryl, the silicate of aluminium and beryllium (otherwise called glucinum), crystallises in Hexagonal prisms, often very large, occurring in granites and other crystalline rocks. The bright green variety, *emerald*, is brought especially from Muzo in New Granada. The pale bluish-green variety is *aquamarine.* H = 7·5–8. G = 2·7.

HAUYNE, named after Haüy, is a silicate of aluminium and sodium with calcium sulphate, occurring in small blue crystals in some lavas. *Lapis-lazuli*, occurring in crystalline limestone in Siberia and China, is a rich blue, more opaque variety, generally massive, used for ornament, but too soft for jewellery. H = 5. Formerly, this stone, reduced to powder, was the *ultramarine* of the painter—a very expensive colour ; but now the pigment can be produced artificially.

III. *Tungstates, Titanates, etc.*

WOLFRAM ($2FeWO_4 + 3MnWO_4$), the tungstate of iron and manganese, commonly found massive, in association with tin ores, is the chief source of the tungstates of commerce, which are used as mordants in dyeing, to harden steel or plaster of Paris, and to render stuffs uninflammable.

SPHENE, named from the wedge-like form of its Oblique crystals (Greek *σφήν*, *sphēn*, a wedge), is a silicate and titanate of lime, occurring in crystalline rocks.

IV. *Sulphates and Chromates.*

ANHYDRITE, calcium sulphate, and **GYPSUM**, the hydrous sulphate, have already been described (Vol. III., p. 178).

BARYTE ($BaSO_4$), a common veinstone, white when pure, but often sherry-brown, crystallises like the former in the Prismatic system. It is used as a white paint. G = 4·8.

CELESTINE ($SrSO_4$), sometimes bluish and commonly associated with native sulphur, crystallises in the same system, and was formerly confused with baryte, witherite, and strontianite under the name "heavy spar." G = 3·9.

ANGLESITE ($PbSO_4$), a white decomposition-product of galena, first noticed in Anglesea, is also Prismatic.

MELANTERITE ($FeSO_4 + 7H_2O$), copperas or green vitriol ; **GOSLARITE** ($ZnSO_4 + 7H_2O$), or white vitriol ; and **CHALCANTHITE** ($CuSO_4 + 5H_2O$), or blue vitriol, are similar decomposition-products of pyrites, blende, and chalcopyrite, more important as artificially prepared than as minerals.

V. *Borates.*

BORAX, the hydrous biborate of sodium, crystallises in short Oblique prisms, is soluble, sweetish-alkaline, and fusible with intumescence. It was originally brought from the shores of a lake in Thibet, the crude salt being known as *tincal ;* but is now extensively prepared from the boracic acid lagoons in Tuscany, and from the Borax Lake of California. It is used as a flux, in soldering and in making enamels.

BORACITE, the borate and chloride of magnesium, is interesting from the relation of its thermo-electric characters to its crystalline form, which is generally the cube combined with the tetrahedron.

VI. *Nitrates.*

NITRE, or saltpetre (KNO_3), though largely prepared artificially, occurs in small white Prismatic crystals in the floors of caves, and as an efflorescence on the soil in hot countries. Its saline cooling taste and deflagration are well known. It is mainly used in the manufacture of gunpowder.

NITRATINE, or Chili saltpetre ($NaNO_3$), which occurs over many square miles of the desert of Atacama, differs in being Rhombohedral, in having only a cooling taste, and in giving a yellow instead of a violet flame. Though its deliquescence unfits it for gunpowder, it forms a most valuable manure, and is used in preparing nitric acid and nitre.

VII. *Phosphates.*

APATITE, the phosphate of lime, having been described (Vol. III., p. 178), we need only mention here wavellite and turquoise, both hydrous aluminium phosphates.

WAVELLITE occurs in small hemispherical groups of radiating Prismatic crystals of a dull pearly greenish tint, on the surface of slate or granite.

TURQUOISE is only known amorphous, coming chiefly from Nishapur in Persia. It owes its blue or green colour to small quantities of copper and iron, is bleached by hydrochloric acid, and decrepitates, turns brown, and gives off water when heated. Being as hard as felspar and susceptible of a polish, it is valued as a gem.

GERMAN.—XLIII.

[*Continued from Vol. VII., p. 380.*]

USES OF THE TENSES.

Rule.—The pluperfect tense is used to express what had taken place at some past time denoted by the context, as :—Nachdem die Sonne untergegangen war, ging er weg, after the sun had gone down, he went off ; er hatte während unſerer Unterredung geſchlafen, he had slept during our conversation.

Rule.—The first future tense is employed merely to express what shall or will take place hereafter ; while the second future is used to denote what shall have occurred at some future period.

OBSERVATION.—The future tenses, both first and second, have their precise equivalents in the corresponding English tenses, and should be used accordingly.

Rule.—The indicative mood is used in affirming or denying that which is conceived to be certain or undoubted, as :—Er wird morgen zurückkommen, he will return to-morrow.

OBSERVATION.—Since the proper office of the indicative is to express reality, it is employed in all absolute or independent sentences. Even in conditional sentences, moreover, it is used, if the condition is assumed as a fact, as :—Biſt du reich, ſo gib viel, art thou rich (that is, *if* thou art rich), give much.

Rule.—The subjunctive mood is used when that which is expressed by the verb is conceived to be uncertain, though possible, as :—Ich habe gehört, daß er die gewünſchte Stelle erhalten habe, I have heard that he has obtained the desired situation.

OBSERVATIONS.—The subjunctive, from its very nature, stands chiefly in dependent clauses; and in this appears under various circumstances. Thus, it is employed—

(1) When the design of the speaker is merely to repeat or quote a statement without vouching for its accuracy, as :—Er meldete mir, daß er ſich verheirathet habe, he told me that he had been married. When, on the contrary, the design of the speaker is to set forth the thing repeated or quoted as something real or undoubted, the indicative must be used, as :—Er will es nicht glauben, daß ſein Bruder geſtorben iſt, he will not believe that his brother is dead.

(2) In like manner the subjunctive is used in subordinate clauses, after such verbs as hoffen, to hope; fürchten, to fear; wünſchen, to wish; wollen, to desire; bitten, to ask; rathen, to advise; verbieten, to forbid; ermahnen, to exhort—since the event, in such cases, may be supposed to be always more or less uncertain, as :—Er fürchtet, daß er Strafe erhalte, he is afraid that he may be punished.

(3) So also the subjunctive is employed in clauses which indicate an end, object, wish, or result, and which are introduced by daß, auf daß, damit, or by a relative, as :—Sprich laut, damit er dich verſtehe, speak loud, that he may understand you.

(4) In cases such as those explained in the observations above, the student must note that that tense of the subjunctive is employed which corresponds with the one used by the subject of the dependent clause at the time when he said or did that which is affirmed of him, as :—Er ſagte, er habe diesmal keine Zeit, he said that he had (lit. *has*) no time at present.

(5) The subjunctive appears also in asking *indirect* questions, as :—Ich fragte ihn, ob er mir das Geld geben könne, I asked him whether he could give me the money. When the question is made *directly*, of course the indicative is used.

Rule.—The conditional mood is used where a condition is supposed which may or may not be conceived to be possible, as :—Wäre ich reich, ſo würde ich ihm ſeine Bitte nicht abgeſchlagen haben, were I rich, I would not have refused his request.

OBSERVATIONS.—(1) Besides the two tenses ranged under the head of *conditional* in the paradigms, it must be observed that the imperfect and the pluperfect of the subjunctive are equally often employed in expressing conditional propositions.

(2) Sometimes, in the way of exclamation, the condition is expressed, while that which depends upon it is omitted; in which case the whole expression, being of the nature of a wish or petition, is often introduced (in translation) by "oh," "I wish that," and the like, as :—Hätte ich doch dieſen Mann nie geſehen! oh, that I had never seen this man! *lit.* had I never seen this man (how happy I should be)!

(3) Not unfrequently the conditional of the auxiliaries mögen, dürfen, ſollen, können, and wollen, is employed to render an expression less positive, or to give it an air of diffidence, as :—Ich wollte, Sie begleiteten mich, I could wish (instead of *I wish*) you would accompany me; dürfte ich Sie um das Meſſer bitten? might I (be permitted) to ask you for the knife?

Rule.—The imperative mood is used in expressing a command, entreaty, or exhortation, as :—Fürchte Gott und ehre den König, fear God and honour the king.

OBSERVATION.—Sometimes, by a peculiar ellipsis, the past participle is employed in place of the imperative, as :—Nur nicht lang gefragt! do not ask long! where the full phrase would be, Es werde nur nicht lang gefragt! let it not long be asked! An die Arbeit gegangen, off to your work!

Rule.—The infinitive mood, either with or without the particle zu (*to*) preceding, is used to represent the being, action, or passion in a manner unlimited, as :—Sterben iſt Nichts, doch leben und nicht ſehen, das iſt ein Unglück, to die is nothing, yet to live and not to see, that is a misfortune indeed; der Wunſch gelobt zu werden, the wish to be praised.

OBSERVATIONS.—(1) The infinitive without zu (*to*) appears—

(*a*) When, as a verbal substantive, it is made either the subject or the object of a verb, as :—Geben iſt ſeliger, als Nehmen, to give is more blessed than to receive; das nennt er arbeiten, he calls that working.

(*b*) When it stands alone, as in a dictionary, as :—Loben, to praise; lieben, to love.

(*c*) After the verbs heißen, to bid; helfen, to help; lehren, to teach; lernen, to learn; hören, to hear; ſehen, to see; fühlen, to feel; finden, to find; as :—Wir lernen tanzen, we learn to dance; ich fühle den Puls ſchlagen, I feel his pulse beat. The verbs lehren and lernen form exceptions to the observation, admitting as they do sometimes the particle zu between them and an infinitive succeeding. The student will note also that the infinitive after all these verbs is in English often best rendered by a participle, as:—Er fühlte ſein Blut gähren, he felt his blood *boiling*.

(*d*) After the auxiliaries of mood, mögen, können, laſſen, dürfen, ſollen, wollen, and müſſen, and after werden when employed as an auxiliary in forming the future tense.

(*e*) After the following verbs in certain phrases, as bleiben, to remain; fahren, to go in a carriage; gehen, to go *or* walk; haben, to have; legen, to lay; machen, to make; reiten, to ride; as:—Er hat gut reden, he has easy talking (*i.e.*, it is easy for him to talk); er machte mich lachen, he made me laugh. Machen, however, cannot as in English be used to signify "to make *or* cause *by force*"; thus, to translate the English phrase, "make him go out," the Germans say, Laß (*not* mache) ihn hinausgehen.

(2) The infinitive with zu is employed—

(*a*) After nouns and adjectives which in English are followed either by the preposition *to* with the infinitive, or by *of* with a participle, as:—Ich war froh, ihn zu ſehen, I was glad to see him; ich bin müde, es zu hören, I am tired of hearing it.

(*b*) After verbs, to express the end or object of their action, as:—Ich komme, mit Ihnen zu ſprechen, I come to (*i.e.*, in order to) speak with you; in which case, also, the particle um often comes before zu, to render the expression more forcible, as:—Liebet die Tugend, um glücklich zu ſein, love virtue in order (um) to be happy.

(*c*) After the verbs following, and others of like import, as:—

Anfangen, to begin.
Befehlen, to command.
Hoffen, to hope.
Fürchten, to fear.
Sich freuen, to rejoice.
Sein, to be.
Pflegen, to be wont.
Hinreichen, to suffice.
Scheinen, to appear.
Wiſſen, to know; etc.

(*d*) After the prepositions ohne (without) and ſtatt or anſtatt (instead of), as:—Ohne ein Wort zu ſagen, without saying a word; anſtatt zu ſchreiben, instead of writing.

(3) The infinitive in German, as intimated before, often performs the office of a verbal substantive. It is then commonly preceded by the neuter of the article, and has all the various cases, as:—Ich bin des Gehens müde, I am weary of walking.

(4) The infinitive active in German, after certain verbs—as, ſein, laſſen, verbieten, befehlen, etc.—is not unfrequently employed passively. Thus, Laß ihn rufen, which (literally) means "let him *call*," may also signify "let him *be called*"; es iſt keine Zeit zu verlieren, there is no time to lose, *or* to be lost.

(5) The Germans often employ the indicative or subjunctive, preceded by daß, where in English the infinitive, preceded by *to*, is used; as:—Ich weiß, daß er der Mann iſt, I know him to be (*lit.* I know *that he is*) the man.

(6) The infinitive in English, preceded by the words *how*, *where*, *what*, *when*, and the like, after such verbs as *tell*, *know*, *say*, and *teach*, cannot be rendered literally into German; the Germans, in such cases, always using the indicative or subjunctive of such verbs as ſollen, müſſen, können, as:—Lehren Sie mich, was ich ſagen ſoll, teach me what *to* say.

THE PARTICIPLES.

(1) The participles in German are varied by cases, following the same rules of inflection as the adjectives. Having the nature of adjectives, the present in a few, and the preterite in many instances, readily admit the degrees of comparison.

(2) The use of the participle as such, however, in German is far more restricted than in English; for in English it is commonly used to form a distinct clause of a sentence, and is thus made to indicate the time, cause, or means of effecting that which is expressed in the main clause; thus we say, "Walking (that is, *by* or *when* walking) uprightly, we walk surely." This mode of expression can rarely, if ever, be adopted in German, in which language—if we desire to translate the above sentence—we must say, Wenn wir aufrichtig wandeln, ſo wandeln wir ſicher, that is, *when* we walk uprightly, we walk surely.

(3) So, too, we say in English, "*Having given* him the money, he went away"; but since there is nothing in German to correspond to this English compound participle, it would be a gross error to attempt to render the sentence literally. Resort must be had, as in the other case, to a different structure, thus:—Als er ihm das Geld gegeben hatte, ging er weg, that is, *after* or *when* he had given him the money, he went away. In this way must all similar cases be managed; we must employ a verb in each clause, and connect the two together by means of suitable conjunctions, such as weil, wenn, als, da, and indem.

Rule.—The present participle, like an attributive adjective, agrees with its noun in gender, number, and case; and may also govern the same case as the verb whence it is derived, as:—Der lachende Frühling, the smiling spring; die alles belebende Sonne, the all-animating sun, *i.e.*, the sun that animates all.

OBSERVATIONS.—(1) This participle is seldom, if ever, otherwise employed with a noun than in an attributive sense. Its predicative use is found almost altogether in those words that have so far lost character as participles as to be commonly recognised only as adjectives, as:—Reizend, charming; kränkend, mortifying; drückend, oppressive; fließend, flowing; etc. Such combinations, therefore, as *I am reading*, *we are walking*, etc., so common in English, are wholly inadmissible in German.

(2) The present participle, in connection with the article, is often used substantively, the noun being understood, as:—Der Leſende, the reader [*lit.* the (one) reading]; die Sterbende, the dying woman.

(3) This participle, however, cannot in German, as in English, be by means of an article turned into an abstract verbal noun. But in order properly to render such phrases as *the reading*, *the writing*, into German, we must use the present of the infinitive; thus:—Das Leſen, das Schreiben.

(4) The present participle, as stated in the rule, may govern the case of its own verb; but it must be noted that the word so governed always precedes the participle, as:—Das uns verfolgende Geſchick, the *us* pursuing fate, *i.e.*, the fate that pursues us. In some instances the words are actually united, forming compounds, as:—Ehrliebend, honour-loving—that is, ambitious.

(5) The present participle is sometimes used with the significance of an adverb—that is, to express some circumstance of *manner* or *condition*, thus:—Weinend ſprach er zu mir, weeping (that is, *weepingly*) he spoke to me.

Rule.—The preterite participle is not only used in the formation of the compound tenses, but may also be construed with nouns, like adjectives, as:—Ein geliebtes Kind, a beloved child.

OBSERVATIONS. — (1) This participle, in its character as an adjective, is far more frequently employed in German than in English. Indeed, many preterites in German, having lost all character as participles, are now used exclusively as adjectives.

(2) The preterite, like the present participle, is sometimes used in an adverbial manner, thus:—Das Buch iſt verloren gegangen, the book is lost (lit. *gone lost*).

(3) This is especially the case with certain participles employed with the verb kommen, as:—Er kömmt geritten, he comes *ridden* (that is, riding on horseback).

(4) Kindred to this is its use, when connected with a verb, to express the *condition* or *state* of the subject, as:—Jetzt ſterb' ich beruhigt, now I die content; in ſeine Tugend gehüllt, trotzt er der Verleumdung, wrapped in his virtue, he defies calumny.

(5) The preterite participle, usually in connection with the accusative, is in some phrases employed *absolutely*, as:—Die Augen gen Himmel gerichtet, his eyes being directed towards heaven; den Gewinn abgerechnet, the profit being deducted.

(6) This participle is sometimes elliptically employed for the imperative.

Rule.—The future participle is used when the subject is to be represented as a thing that *must* or *ought* to take place, as:—Eine zu lobende That, a deed to be (*i.e.*, that *ought* to be) praised.

OBSERVATION.—What is called the future participle in German is produced by placing zu before the present participle, as above. It can be formed from transitive verbs only, and is always to be taken in a passive sense. It is chiefly to be found in the case of compound verbs, thus:—Hochzuehrender Herr, highly-to-be-honoured (*i.e.*, honourable) Sir.

THE ADVERBS.

Rule.—Adverbs qualify verbs, participles, adjectives, and other adverbs, as:—Er hat den Gegenſtand vortrefflich behandelt, he has treated the subject admirably.

OBSERVATION. — Almost all adjectives in the absolute form are in German employed as adverbs. (For remarks on the position of adverbs in sentences see the section on the arrangement of words.)

COLLOCATION OF WORDS.

(1) In the arrangement of words in sentences the German differs widely from the English. Many differences of collocation, accordingly, have already been noted and explained in various other parts of this work. But as every word and member of a sentence in German takes its position according to a definite law of arrangement, and cannot, without great offence against euphony, be thrown out of its proper place, we subjoin here some general instructions on this topic.

(2) The essential parts of every sentence, as already remarked, are the *subject* and the *predicate*. That which is used (properly, some part of the verb of existence, ſein) to couple the subject and the predicate, is called the *copula*. Now, arranging these three parts in their natural order, the subject will come first, the copula next, the predicate last; thus:—

SUBJECT.	COPULA.	PREDICATE.
Das Pferd	war	ſtark.
The horse	was	strong.

(3) When, as in the case of simple tenses, the copula and the predicate are both contained in a single word, that word holds the place of the copula. For example:—

SUBJECT	COPULA	PREDICATE.
Die Blume	blüht.	——
The flower	blooms.	——

(4) In the case of compound tenses, however, the auxiliary takes the place of the copula; which place is also held by the auxiliaries of mood, the place of the predicate being occupied by the infinitive or participle. For example:—

SUBJECT.	COPULA.	PREDICATE.
Ich	habe	geleſen.
I	have	read.
Er	kann	ſchreiben.
He	can	write.

(5) When any verb which assumes the place of the copula is employed in the compound form, the participle or infinitive belonging to it stands *after* the proper predicate, as :—

SUBJECT.	COPULA.	PREDICATE.
Er	iſt	thoricht geweſen.
He	has	foolish been.
Er	wird	geleſen haben.
He	will	read have.

(6) The object of a sentence comes between the copula and the predicate; and if there be two objects, that of the person precedes that of the thing. For example :—

SUBJECT.	COPULA.	FIRST OBJECT.	SECOND OBJECT.	PREDICATE.
Er	hat	einen Brief	—	geſchrieben.
Ich	habe	dem Knaben	ein Buch	gegeben.
Er	hat	den Sohn	einer Sünde	beſchuldigt.

(7) Should both objects, however, be persons, the accusative comes first; except the oblique cases of the personal pronouns (ich, du, er, ſie, es, wir, ihr, ſie), which always take precedence, as :—

SUBJECT.	COPULA.	FIRST OBJECT.	SECOND OBJECT.	PREDICATE.
Ich	habe	deinen Sohn	meinen Freunde	empfohlen.
Er	wird	ihm	ſeine Tochter	geben.

(8) When two personal pronouns form the objects of a sentence, the accusative precedes the dative and the genitive, as :—

SUBJECT.	COPULA.	FIRST OBJECT.	SECOND OBJECT.	PREDICATE.
Sie	haben	es	mir	gegeben.
Wir	nehmen	uns	ſeiner	an.

(9) Adverbs of degree and manner, or nouns governed by prepositions, and serving in the place of adverbs, when they refer exclusively to the verb, stand immediately after the object. For example :—

SUBJECT.	COPULA.	OBJECT.	ADVERB.	PREDICATE.
Er	hat	ſeinen Gegenſtand	vortrefflich	behandelt.
Er	hat	das Geld	mit Freuden	ausgegeben.

(10) Adverbs of time, and phrases used instead of adverbs of time, commonly come before the object and before adverbs of place. For example :—

SUBJECT.	COPULA.	ADVERB.	OBJECT.	PREDICATE.
Ich	habe	geſtern	einen Brief	geſchrieben.
Er	iſt	vor drei Tagen in London	—	angekommen.

(11) Adverbs of place, and nouns with prepositions used as such, generally come immediately before the predicate, as :—

SUBJECT.	COPULA.	OBJECT.	ADVERB.	PREDICATE.
Ich	werde	meinen Sohn	nach Paris	ſchicken.

(12) Nouns and pronouns, with the prepositions appropriate to the verb employed in the sentence, generally come immediately before the predicate. For example :—

Ich habe niemals über dieſen Gegenſtand mit ihm geſprochen.

When, however, the preposition with its noun is merely used to denote the cause or purpose, etc., of what is expressed by the verb, it stands before the object. For example :—

Wir tranken geſtern aus Mangel an Bier Waſſer.
Ich konnte ihm vor Freuden keine Antwort geben.

INVERSION.

(1) In all the cases preceding, the natural order of the leading parts has been preserved; that is, the subject first, the copula next, and the predicate last. But for the sake of giving special emphasis to particular words, this order is often inverted. Thus the real or logical subject is made emphatic by being put *after* the copula, the pronoun es taking its place as a grammatical subject, as :—Es hebt die Freiheit ihre Fahne auf, *liberty* uplifts her standard. When, again, either the copula or the predicate is to be rendered emphatic, they exchange places, thus (*predicate emphatic*):—Sterben müſſen Alle, *die* all must. The chief places in which the copula receives the stress are—

(*a*) In direct questions, as :—Schreibt der Mann?

(*b*) In imperatives, as :—Sprechen Sie mit ihm.

(*c*) In the case of mögen, when used to express a wish, as :—Möge es der Himmel geben!

(*d*) In cases where surprise (generally with doch) is to be expressed, as :—Iſt doch die Stadt wie geſchüt!

(2) When on any one of those words which in the natural order come between the copula and the predicate we wish to lay special emphasis, it must be put either before the other words standing between the copula and the predicate, or else before the subject. In this latter case, however, the subject and the copula exchange places, thus :—Nur von Edlem kann Edles ſtammen; where the common order would be, Edles kann nur von Edlem ſtammen. These inversions, however, chiefly occur when principal and subordinate sentences are connected by conjunctions.

SENTENCES: PRINCIPAL AND SUBORDINATE.

(1) A principal sentence is one that expresses by itself an independent proposition: thus, "It was reported," "He deserves," "John toils."

(2) A subordinate sentence is one that serves as

a complement to a principal sentence, and without which it conveys no complete idea. Thus, in the expressions, "It was reported that the town was taken," "He deserves that we should defend him," "John toils, although he is rich"—the first in each case is the principal, and the second the subordinate, sentence.

(3) In the natural order, the principal precedes the subordinate sentence. But this order is often reversed; in which case the order of the subject and the copula in the principal sentence is also reversed. Thus, in the natural order we say, Ich weiß, daß er es nicht thun kann, *I know* that he cannot do it. Putting the subordinate sentence first, it will stand, Daß er es nicht thun kann, weiß ich, that he cannot do it, *know I.*

(4) When, however, the subordinate sentence comes in after the copula (that is, before a *part* only) of the principal sentence, the natural order of the latter remains unchanged, as:—Ich fand, als ich in London ankam, meinen Freund nicht.

(5) In subordinate sentences, the common order of the leading parts differs from that of the principal sentences, in making the copula come *last*—that is, in making the copula and the predicate exchange places. For example:—

		COPULA.
Er,	der mir den Brief	brachte.
He,	who to me the letter	*brought*.
Der,	deſſen Herz rein	iſt.
Ich weiß,	wo ich ihn geſehen	habe.
Er ſagt,	daß er es nicht thun	kann.
Er iſt arm,	weil er ſehr träge	iſt.

(6) The subordinate sentence is usually connected with the principal one by means of some conjunctive word. The conjunctive word so employed is either a relative pronoun, a relative adverb, or some conjunction proper, expressing cause, condition, purpose, limitation, or the like. (See the examples under the preceding paragraph.)

(7) The conjunctions employed in connecting principal with subordinate sentences are—

Als.
Auf daß.
Bevor.
Bis.
Da.
Dafern.
Damit.
Daß.
Dieweil.
Ehe.
Falls.
Je.
Je nachdem.
Indem.
Nachdem.
Nun.
Ob.
Obgleich.
Obſchon.
Obwohl.
Obzwar.
Seitdem.
Ungeachtet.
Während.
Weil.
Wenn.
Wenn nicht.
Wenn gleich.
Wenn ſchon.
Wenn auch.
Wie.
Wie auch.
Wiewohl.
Wo.
Wofern.

After all these the copula is placed at the *end* of the sentence.

Daß is sometimes omitted, in which case the copula stands not at the end, but just as in a principal sentence, thus:—Er ſagt, er könne ſchreiben.

When wenn is left out, the subject and the copula stand as in a question, thus:—Wenn ich es geſchrieben hätte, ꝛc., *or* (without wenn) Hätte ich es geſchrieben, ſo würde ich es Ihnen geſagt haben.

(8) The following are the conjunctive adverbs, which are used to connect subordinate sentences with principal ones, after the manner of real conjunctions:—

Außerdem.
Daher.
Dann.
Alsdann.
Darum.
Deßwegen.
Deßhalb.
Dennoch.
Deſſenungeachtet.
Nichtsdeſtoweniger.
Deßgleichen.
Deſto.
Einerſeits.
Anderſeits.
Endlich.
Ferner.
Folglich.
Gleichwohl.
Indeſſen.
Hernach.
Nachher.
Jedoch.
Indeſſen (indeß).
Ingleichen.
In ſo fern.
In ſo weit (ſo weit).
Kaum.
Mithin.
Nicht allein.
Nicht nur.
Nicht bloß.
Noch.
Nur.
Sonſt.
Theils-theils.
Übrigens.
Überdies.
Vielmehr.
Wohl.
Zudem.
Zwar.

These all reverse the order of subject and copula when they stand *before* the subject. When, however, they come after the copula, the natural order of the sentence obtains.

(9) Allein, denn, ſondern, aber, und, and oder always stand at the head of a sentence without influencing the order of the other words. Nämlich may also occupy the first place without altering the position of the other words.

(10) Where a mood-auxiliary, or any such verb as takes the infinitive without zu, occurs together with another infinitive, the copula stands *before* the two infinitives, thus:—Wenn ich es hätte thun müſſen, ꝛc., *not* Wenn ich thun müſſen hätte.

BRITISH COMMERCE.—II.

[Continued from Vol. VII., p. 350.]

SEA ROUTES (*continued*).

IV. With America our connection is very close, closer than in early days was the connection between London and Edinburgh. What with cables and fast-going steamships the ocean that rolls between the great continent and our small islands has been reduced to the dimensions of a "herring pond."

These magnificent liners, of course, with their capacious holds and perfect machinery for loading and unloading, convey the bulk of American produce that comes by way of the Atlantic. There are some sailing vessels, however, that bring deals and timber, and the chief ports in this trade are Miramichi, Dalhousie on Chaleur Bay, and Shediac. Steamers purely devoted to cargo also ply, those from Canada calling at Cape Breton Island to coal. So numerous are the steamers of all kinds that cross the Atlantic that they sail in lanes or belts to avoid collision. Those going out keep within a lane of defined limits, and those coming home in another lane. Sailing vessels, however, take quite a different route so as to get the wind in their favour, the prevailing winds for ten months in the year blowing from the west. The chief ports on the Atlantic seaboard for trans-Atlantic shipments are Quebec, Montreal, St. John's, Halifax (Canadian), and in the United States Portland, Boston, New York, Philadelphia, Baltimore, Charleston, Savannah, St. Mary's (Georgia), and Darien. The two latter are called the pitch-pine ports, on account of the prevailing nature of their shipments, the pitch-pine they send us being largely used in the manufacture of bed-room furniture, chapel pews, and masts. Baltimore and Philadelphia send cargoes of tobacco. Among American ports on the Gulf of Mexico are Mobile, Pensacola, another pitch-pine port, and New Orleans. The latter receives all the produce of the Mississippi valley, and is the chief cotton port of America. Another centre of the cotton trade is Galveston. From the coast of the Gulf of Mexico also comes mahogany—the leading ports being Coaxacola, Honduras, and Belize—in sailing vessels. These vessels issue from the Gulf *viâ* the Florida Channel, following the course of the Gulf Stream, which assists them along with its current. From Yucatan used to come sisal hemp for ropemaking; the Bahama Islands, however, which also provide pine-apples, are now likely to become the chief source for this fibre.

Of the West India Islands the most beautiful is Trinidad. Its chief exports are in cocoa and ginger. On the island is an extensive lake of pitch, covering an area of about 150 acres. It is not extensively quarried, though the pitch is of a highly superior quality. Its exports of this natural product, which is also found in Cuba, are consequently small, the reason being that it can be made, though not of the same quality, from the waste products attendant on the making of coal gas. To these islands vessels sail in a straight line from north-east to south-west by the aid of the trade winds; on the homeward journey, however, they more than double their course, sailing first north, and then east, so as to cheat the winds or make an adverse wind favourable.

In South America the most northerly port of any importance is Georgetown, whence is shipped Demerara sugar and cocoa. The chief Brazilian ports are Bahia, Pernambuco, Rio de Janeiro, and Santos, whence come sugar, fibres, and coffee. From Monte Video Uruguay sends wool, hides, horns, grains, and frozen meat, and across the Rio de la Plata is Buenos Ayres, whence the Argentine Republic sends its exports. This is the most southerly port on the Atlantic side of America of any magnitude, and the most southerly point from which we receive any produce at all is the Falkland Islands. These are covered with tussock, a grass that grows about six feet high—not a tree is to be seen anywhere. This grass affords a succulent food for cattle, and the inhabitants, who are all Scotch settlers without any natives, pull up the roots, roast, and eat them. The exports are wool, hides, and frozen meat. The route to South American ports is through the South Atlantic, vessels touching at the Cape de Verde Islands for coal.

V. On the Pacific coast of America to the north Vancouver is the only port of any magnitude. It enjoys now increased importance as being the terminus on the Pacific side of the Canadian Pacific Railway, and from here the Royal Mail steamships of the railway company leave at regular intervals for Yokohama and Hong Kong. Previous to the opening of this route the time between London and Yokohama was forty-three days, now it is twenty-one. Writing on September 2nd, 1891, the New York correspondent of the *Times* thus detailed a race of the mails by this route:—"The race with the mails from Japan to London has been watched here with great interest, and, up to the present, the record breaking has been as satisfactory as the Canadian Pacific Railway could desire. By catching the Inman steamer, *City of New York*, this morning the time between Yokohama and London will probably not exceed twenty-one days. The record of the trip up to the present is as follows:—The *Empress of Japan* left Yokohama at 8.45 a.m. on August 19th, and arrived at the Royal Road, Victoria, at 4.24 a.m. on August 29th. The mails were immediately taken off and sent to Vancouver, where they arrived at noon on the same day. A special train on the Canadian Pacific Railway was in readiness, and without delay the bags were placed in the mail car, the train leaving at 1.8 p.m. It arrived at Brockville. Ontario, at 9.3 p.m. yesterday (September 1st), having made the run from Vancouver, 2,802 miles, in 76 hours 55 minutes, allowing three hours for the difference in time. The transfer across the river at Brockville occupied 38 minutes, and the New York Central Railway then took the train from that point to New York, 300 miles, in 7 hours 2 minutes, reaching the Grand Central station at 4.43 a.m. this morning. The Inman steamship, *City of New York*, was timed to sail at 6.45 a.m., and the mails were on board at 5.10 a.m. They should be in London in the evening of the 8th, thus verifying the prophecy of Mr. Van Horne, President of the Canadian Pacific Railway, that the time between Japan and London would be reduced to twenty-one days."

An idea of this vast railway, which runs during the whole length of its course through British possessions, and of its possible future effects, may be gathered from the following:—

"The close of 1885 found the company, not yet five years old, in possession of no less than 4,315 miles of railway, including the longest continuous line in the world, extending from Quebec and Montreal all the way across the continent to the Pacific Ocean, a distance of three thousand and fifty miles; and by the midsummer of 1886 all this vast system was fully equipped and fairly working throughout. Villages and towns and even cities followed close upon the heels of the line-builders; the forests were cleared away, the prairie soil was turned over, mines were opened, and even before the last rail was in place the completed sections were carrying a large and profitable traffic. The touch of this young giant of the North was felt upon the world's commerce almost before his existence was known; and, not content with the trade of the golden shores of the Pacific from California to Alaska, his arms at once reached out across that broad ocean, and grasped the teas and silks of China and Japan to exchange them for the fabrics of Europe and North America.

"The next three years were marked by an enormous development of traffic, and by the addition of eight hundred more miles of railway to the company's system. One line was extended eastward from Montreal across the State of Maine to a connection with the railway system of the Maritime Provinces of Canada, affording connections with the seaports of Halifax and St. John; another was completed from Sudbury, on the company's main line, to Sault Ste. Marie, at the outlet of Lake Superior, where a long steel bridge carries the railway across to a connection with the two important American lines leading westward—one to St. Paul and Minneapolis and thence continuing across Dakota, the other through the numberless iron mines of the Marquette and Gogebic districts to Duluth, at the western extremity of Lake Superior; still another, the latest built, continues the company's lines westward from Toronto to Detroit, connecting there with lines to Chicago, St. Louis, and all of the great Mississippi Valley. And, now, the company's lines spread out towards the West like the fingers of a gigantic hand, and the question 'Will it pay?' is answered with earnings for the past year of 16½ million dollars, and profits of 6¼ millions.

"Canada's iron girdle has given a magnetic impulse to her fields, her mines, and her manufactories, and the modest colony of yesterday is to-day an energetic nation, with great plans and hopes and aspirations."

The traveller to Yokohama by this route from Liverpool journeys first to New York, a distance of 3,180 miles, then to Montreal (384 miles), then to Vancouver (2,906 miles), and thence across the Pacific to Yokohama, 4,300 miles—in all, 10,770 miles. The railway journey to Vancouver from Montreal occupies about 5½ days, and traverses the most magnificent scenery in the world. In the summer observation cars are attached to the trains whilst crossing the mountains, so as to enable passengers to take a sweeping view. The steamships from Vancouver to Yokohama take a northern course, making the journey about 300 miles shorter than the more southerly routes usually taken.

Besides Vancouver, there are on the coast of British Columbia the Hudson's Bay Company's stations, whence their furs are collected and sent home by ship. South of this, in United States territory, is the lumber-shipping port of Puget Sound. From Portland, Oregon, and San Francisco, which possesses one of the finest harbours in the world, are shipped large quantities of wheat in first-class sailing vessels. From the Pacific side of Mexico come the dye-woods; and from Guayaquil, Ecuador, cocoa and coffee. Along the Peruvian and Chilian coasts are numerous ports, between which a local trade is carried on, the main ports for the shipment of nitrates being Iquique and Pisagua, and of wheat Concepcion and Tahalcuanho. The trade is carried on both by steamers and sailing vessels, the former coming home through the Straits of Magellan, the latter rounding Cape Horn at a safe distance from the land.

VI. From Australasia and the southern Asiatic ports the shortest route is by way of the Suez Canal. Only steamers, however, carrying cargoes for which special freight-rates are charged can afford to come this way, by reason of the high tolls, which amount to 14 francs a ton. The revolution effected in our trade with the East by the opening up of the Suez Canal may be gathered from the following table showing the distances from London to the main ports in India, China, and Japan by way of the Canal and by way of the Cape of Good Hope, the exclusive route formerly:—

	Viâ Suez.	Viâ Cape.	Distance saved.
London to Bombay ...	6,274 n.m.*	10,719 n.m.	4,445 n.m.
,, ,, Calcutta .	7,974 ,,	11,606 ,,	3,682 ,,
,, ,, Hong Kong ..	9,730 ,,	13,149 ,,	3,419 ,,
,, ,, Shanghai ...	10,466 ,,	13,805 ,,	3,339 ,,
,, ,, Yokohama ...	11,651 ,,	14,497 ,,	2,846 ,,

* Nautical miles.

To reach the foregoing ports, sailing vessels from London by way of the Cape take, on the average—Bombay, 100 days; Calcutta, 108; Hong Kong, 125; Shanghai, 130; Yokohama, 137. Steamers by way of the Canal, steaming only 10 knots an hour, take to Bombay, 26 days; Calcutta, 33; Hong Kong, 40; Shanghai, 43½; and Yokohama, 48. Among the effects of the Suez Canal upon shipping was the increased use of steamers in our trade with the East. Previously steam, though employed on the Cape route, was never remunerative, as the distances between the coaling stations were so great that cargo had to be sacrificed to make room for fuel. As to the effect upon business methods, the Chairman of the P. & O. Steam Navigation Company (Sir Thomas Sutherland, M.P.) says:—"The annihilation of distance effected by the Canal has brought the East to our doors, and entirely changed the bases of our transactions with these countries. If some Rip van Winkle had fallen asleep while at the head of the affairs, say, of a great house in China, twenty years ago, and were to wake up to-day, he would be even more bewildered than his prototype was when he descended from the Catskill Mountains. He would find that all the old ways and most of the old firms had disappeared. The virtual monopolies which the distance between the East and West had established in the hands of comparatively a small number of firms would be found to have come to an end. The valuable produce of China and Japan is no longer held in the London market until the exporter is satisfied as to his profit. The merchant on this side is master of the situation; for by sending out a telegram he can receive in the course of six weeks whatever consignment he pleases in this country. Before the opening of the Canal, six months would have elapsed, even with the aid of the telegraph, before such orders could have been executed. On the other hand, in the export trade from this country, it is no longer the London or Manchester firms which determine the price to be paid in the East. It is the native buyer, operating through his bazaar or his hong; and in the Indian trade the native merchant may be said, even now, to be the operator on this side, for Manchester goods are shipped mostly on bazaar indents—a system rapidly extending to transactions with China." Great as have thus been the effects of the Suez Canal upon commerce, yet only about half our trade with India passes through it, the other half still adhering to the Cape route. The China and Japan trade which is carried on in steamers passes through the Canal. As regards our Indian trade, leading ports and products, are, jute from Calcutta and Chittagong, cotton from Bombay and Tuticorin, rice from Madras and Rangoon, teak timber, whence is made the wedges or keys used on the permanent ways of our railways, from Upper Burmah.

By the Suez Canal route our Australasian colonies are also brought nearer. Purely trading vessels, however, use the old route. Outward bound, after a ship crosses the line the trade winds drive her to the S.W. Losing the trades, she gets into the prevailing westerly winds of the southern hemisphere, which blow her due east upon New Zealand. Homeward bound she proceeds eastward round Cape Horn, the prevailing winds being behind her until she reaches latitude 35°, when she gets within the influence of the trades, which strike her on the right or starboard side at right angles to her course, the most favourable wind a ship can have. Across the line she meets the north-easterly trades, which are thus against her, as it is to the N.E. that she is sailing. She then proceeds N. until about latitude 32°, when she gets into the prevailing westerly winds of the North Atlantic, and is by them blown right upon our shores.

ON SHIPPING PRODUCE—HOW THE QUANTITY AND VALUE OF OUR IMPORTS IS OBTAINED.

When a shipper puts goods on board a ship, he receives to two or more similarly worded documents the signature of the captain. Here is a copy of an actual document of such a kind, the goods in this case being shipped at Stockholm:—

"Shipped by Messrs. ———, and upon the good steamship ———, master, ———, now lying in this port, and bound for London Surrey Commercial Docks (120,204), one hundred and twenty thousand two hundred and four pieces of planed deals and boards, all under the deck.

"To be delivered at the said port of London as above (all and every dangers and accidents of the seas and of navigation of what nature and kind soever excepted) unto order.

"Freight for the same and other conditions as per charter-party—dated Stockholm, the 10th November, 1891.

"In witness whereof I, the master of the said ship, have signed four bills of lading, all of this tenor and date, one of which being accomplished the others to stand void.

"(Signed) ———."

The above is a copy of a bill of lading, three other similar bills in this case having been signed by the master of the ship and given to the shipper, he himself retaining the fourth. All bills of lading are of similar purport to this one, the language and some of the conditions being varied. For instance, the exceptions to the goods being delivered in the condition in which they were shipped read thus in another bill:—"the Act of God, the King's enemies, fire and all and every other dangers, and so on as above." Another, relating to a cargo of rice shipped at Rangoon, goes into every detail at great length, and shows the special dangers attending navigation from that quarter. Here is only a small part of it:—"The Act of God; the Queen's enemies; pirates, robbers by land or sea; restraints of Princes, rulers, and people; vermin, rain, spray, leakage, rust, decay, loss or damage from . . . . jettison, barratry, misfeasance, error in judgment, etc. . . . . nor liable for incorrect delivery unless each package shall have been distinctly marked by the shippers, before shipment, with the name of the port of destination, in letters not less than two inches long."

The reverential tone of these bills of lading, though still striking, has considerably diminished since the system of insuring goods has been universally adopted. In early times, too, the seas were less known than now, and the dangers attending navigation greater. Merchants, therefore, were more timid, and usually added a prayer to their bills of lading for the safety of the ship and cargo.

Other variations in bills of lading from the sample given are—instead of "to be delivered . . . . unto order," "to be delivered as addressed," and instead of the freight being "as per charter-party," it may be at so much per ton. The charter-party is an agreement between the shipper and someone on behalf of the ship, in which the conditions of conveying the goods are set forth.

The reason that several bills of lading are signed in respect of each consignment is in case of loss or damage to the bill intended for use. Mails coming from far away countries may be lost at sea or damaged, and in case of contingencies of this kind it is evidently desirable to have other documents to fall back upon. It is on account of this multiplicity of bills of lading that the clause is inserted, "one of which being accomplished, the others to stand void."

When the consignment has been loaded and the bills of lading signed, the shipper proceeds to his banker. To him he endorses over the bill of lading and the insurance policy of the goods, receiving in return an advance of money according to their worth, the banker, of course, charging a commission. The banker then forwards the documents to his agent in London. Meanwhile the shipper advises his London correspondent that certain cargo is on the way, and when it arrives the correspondent goes to the bank, and, in exchange for his bill, payable at three months or six months, according to the terms that he may be able to make, the bill of lading is surrendered to him. With this duly stamped by the ship-brokers to show that freight and so on have been paid and settled, he proceeds to the docks and has the goods delivered to him. He then gets a produce broker in Mincing Lane or Mark Lane or the Wool Exchange, according to the kind of goods, to sell the goods, and with the money so acquired is able to meet the bill lodged with the banker's.

In the foregoing process everyone implicated is safeguarded, and business facilitated. A shipper may have a capital of only £100,000, but he can trade up to five or ten times that amount. Suppose the whole of his £100,000 to be embarked on a cargo, he can go with his bill of lading and insurance policy to the bank, raise money on them to invest in another cargo. On this other cargo he can similarly raise more money, and so on to various lengths, according to his temperament, his standing in business, and the state of trade.

The bank is equally safeguarded. If anything happens to the goods on the voyage, it does not signify—they are insured. Then in releasing the bill of lading, the bank's agent at the port of destination knows the man he is releasing it to, or else has guarantees that the bill he is exchanging it for will be duly honoured when it falls due. In no other way could an extended commerce between different nations be carried on. The shipper of goods, say from St. Petersburg to London, could not bring the laws of Russia to operate in enforcing the payment of a debt owed by the agent to whom he might send goods in London. The bank can, however, under the laws of this country, force the agent to keep the terms he has entered into with it. Another advantage to the shipper results from what may be called the anonymity of bills of lading. The name of the consignee not appearing on the bill, no one knows who the shipper's customer may be—an item of information that might prove very useful to a rival trader, and he is thus ensured in reaping the reward of his own enterprise.

A ship's cargo may be composed of one consignment only. It may be full, say, of rice from one shipper to one destination. In such a case the contents of the bill of lading would correspond with the ship's "manifest." Again, a ship's cargo may be composed of hundreds of different consignments—that is, different lots of goods from different shippers to different consignees, every lot involving a separate bill of lading. In this case the ship's manifest is compiled by the captain from the different bills of lading. The manifest is thus an inventory of all the goods on board. Here is a specimen of part of a manifest:—

"In the barque ———, of Norway, 1,128 tons, seventeen men. Master, ———, from Colombo and Cochin.

OL SNT	237 barrels Plumbago.	Order
V	2064 ballots Coir Fibre.	,,
DR London.	250 cases Citronella Oil.	,,
H.A.I.A.A.	225 bags Turmeric.	,,
F.C.C.I	101 casks Cocoanut Oil.	,,
	&c. &c. &c.	
	STORES * 6 bottles Lime Juice. 20 lb. Coffee."	

The ship's manifest is for the guidance of the Customs officials, to whom a copy must be delivered by the captain within twenty-four hours of his arrival in dock, under a penalty of £20. This is called reporting, and it is from such reports that the "Bill of Entry"—a daily publication issued by the Custom House, giving the vessels and cargoes that have entered our ports—is compiled. Another document that has to be presented at the Custom House before a consignment can be released bears a description of the consignment according to the classification of the Imperial Tariff, the quantity, and the money value. It is from these documents, called entries, that the Board of Trade returns, giving the quantity and value of our imports, are compiled.

We have already explained how merchants, by procuring advances from bankers on successive cargoes, are not restricted in their trading operations by the amount of their capital. It is in this manner that the bulk of our commerce is carried on; no enterprising merchant would dream of confining his operations to what his own money would buy. This is perfectly legitimate trading; it has, however, an element of danger in it. When prices are high and the market brisk, merchants use their utmost endeavours to supply the market. They embark in cargo after cargo to the full extent of their ability. In time the market becomes glutted with the particular kind of commodity they have been sending over, prices fall, and the goods cannot be sold, except at a loss. The banks then cease to advance money, and trade stagnation sets in. This kind of stagnation in trade is described as the result of over-trading, over-speculation, and its remedy is simply a matter of time, when the surplus stocks shall have been consumed. Such is the danger of the credit system.

There is another kind of trading that is not legitimate, though it is very widely practised, and especially in periods of stagnation following on over-trading, when there is little doing. At such times, as in busy times, merchants have their staffs of clerks to keep up and expensive offices. They have appearances to keep up as well. It would never do to have a room full of clerks all idle. It would look as though no business were being done, and a man concerning whom it can be said that he is doing no business is not likely to get any to do.

Thus in times of stagnation, when there are no legitimate transactions to do, merchants are tempted to engage in pure and simple speculation, gambling it is often called. In these transactions no part is played by any actual produce. One man sells another so many pounds of pepper at three months, say. The seller has no pepper, and does not intend to have any, and the buyer has no intention of buying actual pepper. All that is implied in this transaction is that in three months' time, if the price of pepper has gone up, the buyer will receive the difference between the present price and the price it rises to at the end of the three months; if, again, the price goes down, the seller then receives the difference from the buyer. Transactions of this nature are duly entered into the books of the parties to them, and wear all the semblance of real business.

When a bogus sale of this kind takes place, two parties immediately become interested in the price of pepper three months hence. The bogus buyer is anxious for the price of pepper to go up, the bogus seller for it to go down. The seller consequently keeps on selling pepper to the full extent of his ability, which is to the extent to which he can get buyers to buy. The buyer similarly keeps on buying pepper to the full extent of his ability, which is to the extent to which he can get sellers to sell. There is thus no limit to transactions of this kind—the moment the seller ceases to sell, up goes the price, which means a loss to him; and the moment the buyer ceases to buy, down goes the price, which means a loss to him. There is thus no halting. The seller gets his friends to join him. the buyer gets his to join him; rings are thus formed, excitement grows, the opposing rings grow larger, the excitement grows more intense. Finally the weaker members of the opposing rings break down, unable to meet their liabilities, then stronger members, and then the strongest of all—sometimes mercantile houses of high repute and doing an extensive legitimate business.

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* Only dutiable articles are included in the stores enumerated in the manifest.

THE ORGANS OF SENSE.—VI.

[*Continued from Vol. VII., p. 365.*]

III.—THE ORGAN OF SMELL (*continued*).

In birds the sense of smell is by no means so efficient as in mammals. This we may pronounce with certainty, because not only is the organ and its accessory apparatus less developed, but the habits of birds indicate that they are but little guided by the sense of smell. Raptorial birds, like flesh-eating animals, have better developed olfactory organs than grain-feeding fowls. The main nerve of smell of the vulture is five times the thickness of that of the turkey, although the carrion-feeding bird (first-named) does not exceed the other in weight; but it would seem that this sense in the vulture and condor is only useful to them in selecting while at their meal, and does not guide them to the meal itself. A number of confined condors had some steaks of flesh, wrapped in paper, placed before them, but they gave no sign of being aware of their presence; when however, the paper was removed, they were seen tumbling over one another in their eagerness to snatch the food.

The general peculiarities of the organ of smell of birds are the following:—The nerve leaves the skull by one hole, and not through many, as in mammals; the membrane to which the nerve of smell goes is confined to the base of the beak, and the outer nostrils are not at the end, but at its sides or base; and though these nostrils are sometimes protected by a scale (as in the pheasant), or a sheath (as in the stormy petrel), or a bunch of stiff feathers (as in the raven), there are never any flexible cartilages moved by muscles. That singular wingless bird, thence called the apteryx, affords the only exception to the above statements, for its nostrils are at the end of its bill, the upper turbinated bones are of very large size, and many nerves pierce the skull, as in the mammalia. These peculiarities indicate greater acuteness in the sense of smell; and this is thought to be associated with its habit of probing among loose earth, to hunt for worms by scenting them.

In the pelican there are no external nostrils whatever; and this is, no doubt, reasonably accounted for by the fact that this bird fishes under water with its long bill, and detains its prey for inspection in its capacious pouch. While in this position the contents of the bill send off effluvia to the nose by the back way of the palate; and since the nostrils of the bird, if it had any, would be above the water, and its prey below it, they could be of no service.

In the higher reptiles, the internal organ is very like that of birds; but in some the nostrils are wide apart, and in others, as in all the crocodiles, they are united into one, which in the true crocodile of the Nile is shaped like a half-moon, and closed by a valve from behind; and in the gavial, or slender-snouted crocodile of the Ganges, the skin round the nostril can be raised so as to allow it to be just lifted above the surface, while the rest of the animal is concealed. In both cases the nostril is placed at the tip of the snout, for reasons which those who have read the lessons on the ear will understand. Space fails to write of the organ in the serpent, the frog, and the siren; but, in passing on to describe it as it occurs in the fish, it should be remarked that in all the foregoing animals there is a communication between this organ and the air-passage to the lungs.

The position of these hind nostrils, as they are called, is, as we have seen, very various. In some cases they open just behind the teeth, as in the toad; and in others far back in the alimentary canal. They are sometimes double, and sometimes single; but they are always present, and consequently these animals all breathe naturally through the nose, and for this reason it has been difficult to discuss the function of smell without trenching on the function of respiration. In fish, on the contrary, there are no lungs; and therefore the hind outlet of the nose is not present, and the organ is solely an organ of smell.

Its usual form is that of a roundish sac, opening on the side of the muzzle by one or two external holes. The sac is either round, in which case a column of cartilage rises in the centre, and radiating folds run from this to the circumference; or elongated, when a bar of cartilage runs across it; and on each side of this plates pass off to the sides; and these secondary plates at their middle portion are elongated into flaps, which float freely in the water of the sac. An example of the first form is seen in the sturgeon, and of the last in the ray and dog-fish. In the drawing of the dog-fish, one sac is represented (Fig. 10) with a fore-and-aft flap to the nostril, the fore flap being pulled forward by two threads, so as to disclose the interior; while, on the other side, these flaps have been wholly removed, to expose the organ. These cartilaginous flaps are moved by proper muscles, so that the water in the sacs can be rapidly changed by their action; hence these fish have been said not only to smell, but to scent their prey. In the lamprey, or nine-eyed eel, the nasal sac is single, and in the middle line above the head.

In the nautilus Professor Owen detected an organ of smell, and such organs as are thought to be olfactory in other molluscs are always placed near the breathing orifice. In insects or crustaceans some of the joints of the antennæ are modified, and contain small sacs, in the walls of which fine nerve-twigs end; these are, with some show of reason, supposed to be the organs of the sense of smell.

IV.—THE ORGAN OF TASTE.

In proportion as sensations are dissociated from our mental processes, so are they more closely linked with our animal wants. Sensation has two functions—one is to inform the intellect and set the thoughts a-going, and the other to prompt us to do that for the well-being of the body, or for the good of our race, which we should not do, or not do so well and fittingly, unless we were so prompted. All sensations perform both of these functions, but they perform them in very different degrees: thus, the eye, of all the organs of sense, is the most efficient caterer to the mind, but it scarcely prompts directly to any instinctive act. It may stir pleasurable ideas in the mind, but the sensations of sight, irrespective of the ideas they leave, can scarcely be called either pleasurable or painful. Now if we contrast with this most intellectual of all our senses that which is associated with the tongue, we shall find that *its* relation to these two functions is reversed. The mind, it is true, discriminates between sensations of taste, but it does not dwell upon them, and it cannot readily recall the distinctions to memory. If this statement should be thought to be incorrect, because gross sensualists may be said to dwell much upon the gratification of their appetites for meats and wines, it may be answered that they dwell not so much on the distinctive ideas of the sensations, as on the general remembrance of the gratification they caused; and they dwell on it not as in itself worth entertaining, but as useful knowledge to aid them in repeating the pleasure at some future time. Few men take delight in dwelling on or describing the sensations of taste; but even an anchorite will own that the pleasures of this sense are, while they last, intense, and quite sufficient to cause ordinary individuals to keep the body well supplied with good food, even though the thought of what quantity or quality of aliment is necessary never crosses the mind. The young, whose tastes have not yet been vitiated, usually eat heartily, with a keen sense of enjoyment while at their meals; but between these their minds are wholly unoccupied with the nature or the pleasures of these meals. The contrast drawn above seems fully to bear out the statement that sensations which are good incentives to intellectual action are not good prompters to instinctive action; and that in proportion as senses cease to be discriminating, they become pleasurable or painful. A pleasurable or a painful sight means one which impresses the intellect favourably or not; but an agreeable or disagreeable taste is strictly confined to the sensation itself.

It will be shown, in speaking of the organ of taste, how intimately the gratification of this sense is bound up with the necessities of the body. In the meantime, assuming this to be the case, we remark that inasmuch as the wants of the mind are insatiable, while those of the body are limited, the senses more intimately connected with each partake of the nature of these different wants; hence, while the eye is never satisfied with seeing, the gustatory sense is soon cloyed, and the appetite it engenders is only intermittent. Again, with regard to those sensuous impressions which are pleasurable, it would seem that Providence has ordained that the pleasure shall be so united to the requirements of the body, as that it shall be impossible fully to enjoy the pleasure without supplying the requisites to health and use. On the other hand, no natural necessity can be satisfied without gratifying the senses. Even *our* limited understanding recognises that it would be dangerous to entrust men with an animal enjoyment which was objectless, and which could be constantly excited; for this would be a bar to all the higher aspirations of the soul. The Divine Wisdom has not only recognised this danger, but has provided against it by such elaborate contrivances that the attempt to gratify the senses irrespective of the ends for which they were given us—an attempt sure to prove abortive sooner or later—is considered to be not only sensual, but unnatural.

The preceding remarks are necessary to the appreciation of some points in the structure and position of the organ of taste. The sense of taste is not of quite so simple a nature as those of sight and hearing, or even of smell. This sense seems to shade away insensibly, on the one hand, into that of ordinary touch, which the inside of the mouth shares with the whole surface of the body; and, on the other, it graduates into another sense, which may be called a sense of relish, which the mouth shares with the stomach and alimentary canal. The seat of the sense of taste is the tongue; but here again it is necessary to remind the reader that the uses of this organ are not confined, as those of the eye and ear are, to the reception of the impressions which excite the sense. The tongue is, in its substance, a sheaf of muscles, and it is largely employed in keeping the food between the teeth that it may be ground down, in crushing the softer mass and mixing it with the saliva, and in propelling it into the throat. It is further employed as an instrument of speech; so much so, indeed, that in poetry—and even in common speech—it is more prominently associated with this office than with any other, and in this capacity has been the object of that powerful and poetic description contained in the Epistle of James. Nevertheless, since the organs of taste are distributed over the surface of the tongue, it seems necessary to describe it as a whole. If the reader will refer to the engraving (Fig. 11) he will find the surface of the tongue drawn as it would be seen if the whole of the roof of the mouth and skull were removed, so that he could look down upon it from above. The tongue covers the floor of the mouth; its border lies against the teeth. From the tip it rises to its central part, then slopes away backward to the throat, so that it nearly fills the closed mouth, and its upper convex surface lies along under the concave palate. It has great freedom of movement, so far as its tip and edges are concerned, but cannot be curled completely over and thrust down the throat, because it is confined by a membrane, which attaches the middle line of its under surface to the bottom of the mouth. At one time it used to be the barbarous custom of nurses to cut this membrane in new-born infants, a custom which not unfrequently resulted in the child being choked by its own tongue. It is with the upper surface of the tongue we have to do, as there the organs of taste are found, and thereby the food passes, seldom getting below the edges of the tongue. The tongue is covered with a mucous (or slime-secreting) membrane, and this membrane on its upper surface has a number of little projections. These projections, or papillæ as they are called, are of three kinds, named respectively circumvallate, fungiform, and filiform papillæ. The circumvallate papillæ are situated at the back of the tongue, and are from eight to fifteen in number, ranged in the form of a V, with its point backwards towards the throat. They are of singular shape, best explained by the small figure which gives both a section of one of them and half its surface. They each consist of a button-like projection of the mucous membrane, surrounded by a depression, and then an elevated ring which has another depression around it. They are called circumvallate, or walled round, papillæ, because they may be compared to a central tower surrounded by a wall; but the wall is a sunken wall, only made by sinking two ditches—one outside and the other inside it. The outside ditches of these miniature imaginary fortresses touch one another, and that which lies behind the hindermost one is so deep as to be called the *foramen cæcum*, or blind hole. These papillæ are the largest of all; they are more powerfully affected by flavours than any others, and it is thought that the sapid juices run into the depressions around them, and thus the sense of taste is agreeably prolonged. It will be seen from the engraving that all the papillæ have secondary ones; but while the main papillæ thrust up the outer bloodless coat of the mucous membrane before them, the secondary

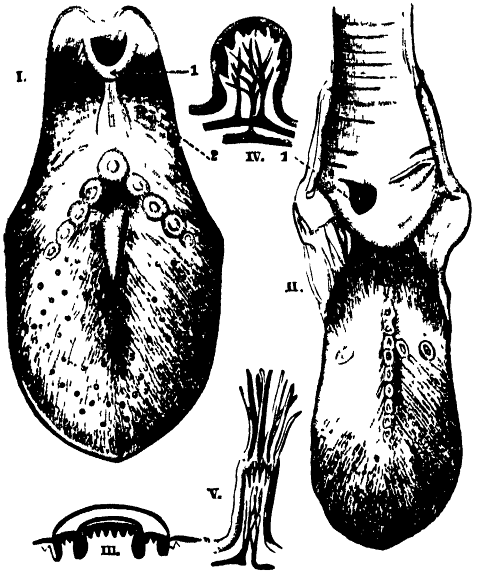

Fig. 11.—I Human Tongue. II. Tongue of Chimpanzee, with Larynx. III. Circumvallate Papillæ. IV. Fungiform Papillæ. V. Filiform Papillæ.
Ref. to Nos. in Figs.—I. 1, Epiglottis; 2, Mucous follicles. II. 1, Bristle passing into the pouch of the larynx.

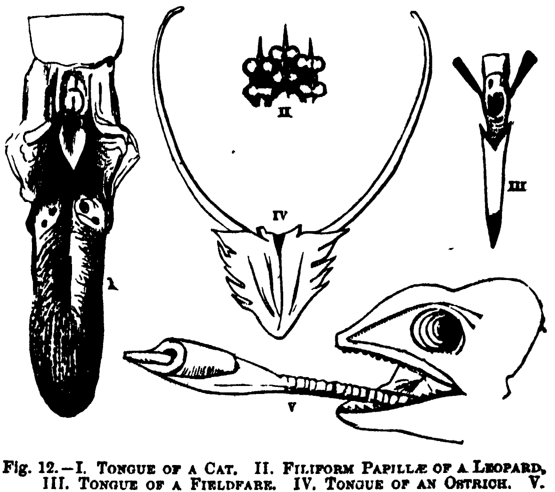

Fig. 12.—I. Tongue of a Cat. II. Filiform Papillæ of a Leopard. III. Tongue of a Fieldfare. IV. Tongue of an Ostrich. V. Tongue of a Chameleon.

ones (*i.e.*, the papillæ on the papillæ) do not do this.

The fungiform papillæ are scattered irregularly over the front two-thirds of the tongue, but are more plentifully distributed towards the edges and tip than at the central part. This arrangement prevents the delicate papillæ being crushed by the tongue while it squeezes the food against the hard palate, while, at the same time, they are so placed that the juices of the food so squeezed run off the summit of the tongue, and come into contact with these little rounded eminences. Should the reader examine his own tongue, he will perhaps not at once detect these round papillæ, for they are obscured by the dense coating of filiform papillæ, which are, under ordinary circumstances, longer than they. If, however, he press his finger on the middle of his tongue, these round knobs will at once start out and become visible, being distended with blood. If, further, a little vinegar be placed on the tongue in a space between these papillæ, no taste is observed; but if it run on to them, they immediately erect themselves, and the sour taste is distinctly conveyed.

The filiform papillæ cover the fore part of the tongue, running in lines from the middle obliquely forward towards the edges, and other lines of them run, outside these, round the extreme point of the tongue. They are long and slender, and much smaller than the others, and are surmounted by a tuft of threads, consisting of thick epithelium (or outer bloodless layer); and hence they look white or yellow, and impart to the whole top of the tongue a light colour, which contrasts with the deep red of its edges and under side. These papillæ are probably rather the ultimate organs of touch than of taste.

All these papillæ are well supplied with blood-vessels, so that, when the outer coat is taken off, they seem, under the microscope, to be little else than tufts of blood-vessels. Nerves forming loops have been traced into them, and these are the carriers of the sensuous impressions. These nerves proceed by two different routes to the brain. Those which proceed from the papillæ (including the circumvallate) at the back of the tongue, are gathered into a bundle which joins the ninth pair of nerves; and those from the papillæ at the front unite to form a branch of the fifth pair. Each of these sets of nerves conveys both common sensation and the special sense of taste; but the branch of the ninth is more concerned in carrying gustatory impressions, for the sense of taste is keenest in the large walled-round papillæ, and the pleasures of taste become gradually more intense in proceeding from the front backwards.

GREEK.—XIX.

[*Continued from Vol. VII., p.* 341.]

PERMUTATION OF CONSONANTS.

THE variations in letters which have come under our notice are not arbitrary, but depend chiefly on euphonic laws. Of such laws and observances we have already spoken, in giving the uncontracted and contracted vowel equivalents. The consonants also, in coming together, undergo changes according to determinate rules.

The consonants are divided into liquids (namely, λ, μ, ν, ρ) and mutes (namely, π, κ, τ; β, γ, δ; φ, χ, θ), and by the union of σ with these the double consonants ψ, ξ, and ζ are produced: thus—

ψ is equal to πσ, βσ, or φσ.
ξ ,, κσ, γσ, or χσ.
ζ ,, δσ.

The nine mutes are divided in three ways, namely —first, the organ chiefly employed in pronouncing them, as—(1) *Palatals* (pronounced by the palate), κ, γ, χ; (2) *linguals* (pronounced by the tongue), τ, δ, θ, called also *dentals;* and (3) *labials* (pronounced by the lips), π, β, φ. A second classification arises from considering what may be termed the predominant sound: thus, in κ, γ, χ you have a *k*-sound; in τ, δ, θ, a *t*-sound; and in π, β, φ, a *p*-sound. There is also a third division into *tenues* (or slender), κ, τ, π; *mediæ* (or middle), γ, δ, β; and *aspiratæ* (or aspirate), χ, θ, φ.

The following, then, are the facts which regard the use and interchange of the consonants:—

A *p*-sound (π, β, φ) or a *k*-sound (κ, γ, χ) before a *t*-sound (τ, δ, θ) must be of the same kind with a *t*-sound—that is, before a tenuis, as τ, can only be placed a tenuis, as π or κ; before a media, as δ, only a media, as β or γ; before an aspirata, as θ, only an aspirata, as φ or χ. Thus you have πτ and κτ, βδ and γδ, φθ or χθ: thus—

								CORRECT FORM.
β	before	τ	becomes	π,	as	τρίβ-ω, *I rub,*	τέτριβ-ται,	τέτριπται.
φ	,,	τ	,,	π	,,	γράφω, *I write,*	γέγραφ-ται,	γέγραπται.
γ	,,	τ	,,	κ	,,	λεγω, *I speak,*	λέλεγ-ται,	λέλεκται.
χ	,,	τ	,	κ	,,	βρέχω, *I wet,*	βέβρεχ-ται,	βέβρεκται.
π	,,	δ	.,	β	,,	κύπτω, *I bend,*	κύπ-δα,	κύβδα.
φ	,,	δ	,,	β	,,	γράφω, *I write,*	γράφ-δην,	γράβδην.
κ	,,	δ	,,	γ	,,	πλέκω, *I weave,*	πλέκ-δην,	πλέγδην.
χ	,,	δ	,,	γ	,,	βρέχω, *I wet,*	βρέχ-δην,	βρέγδην.
π	,,	θ	.,	φ	,,	πέμπω, *I send,*	ἐπέμπ-θην,	ἐπεμφθην.
β	,,	θ	,,	φ	,,	τρίβω, *I rub,*	ἐτριβ-θην,	ἐτρίφθην.
κ	,,	θ	,,	χ	,,	πλεκω, *I weave,*	ἐπλέκ-θην,	ἐπλέχθην.
γ	,,	θ	,,	χ	,,	λέγω, *I say,*	ἐλέγ-θην,	ἐλέχθην.

The preposition ἐκ remains unaltered before δ and θ; as ἐκδοῦναι, ἐκθεῖναι, etc., not ἐγδοῦναι and ἐχθεῖναι.

The tenues (namely, π, κ, τ) pass into the corresponding aspiratæ (φ, χ, θ) not only in derivations and inflections, but also in compounds, before an aspirated vowel: thus—

Instead of	ἐπήμερος,	write	ἐφήμερος (ἐπί and ἡμέρα, *a day*).
,,	ἐπυφαίνω	,,	ἐφυφαίνω (ἐπί and ὑφαίνω, *I weave*).
,,	τέτυπ-α	,,	τέτυφα (τύπτω, *I strike*).
,,	οὐκ ὁσίως	,,	οὐχ ὁσίως (ὅσιος, *holy*).
,,	δεκήμερος	,,	δεχήμερος (δέκα, *ten*, and ἡμέρα).
,,	τέτριβ-α	,,	τέτριφα (τρίβω, *I rub*).

These changes also take place in *crasis* (that is, where two vowels are mixed into one), as θἄτερα from τὰ ἕτερα. If the tenues πτ or κτ precede, both must be converted into aspirates, as ἐφθήμερος instead of ἑπτήμερος (from ἕπτα, *seven*, and ἡμέρα, *day*).

A *t*-sound (τ, δ, θ) before another *t*-sound passes into σ, but in the perfect and pluperfect active is dropped before κ: as—

ἐπείθ-θην,	from	πείθω, *I persuade*,	becomes	ἐπείσθην.
πειθ-τέος	,,	,, ,,	,,	πειστέος.
ἠρείδ-θην	,,	ἐρείδω, *I prop*	,,	ἠρείσθην.
πέπειθ-κα	,,	πείθω, *I persuade*	,,	πέπεικα.

N before another liquid passes into the same liquid: as—

συν-λογίζω, *I reason*,	becomes	συλλογίζω.
ἐν-μένω, *I remain in*	,,	ἐμμένω.
συν-ρίπτω, *I throw with*	,,	συρρίπτω.

The same is seen in the Latin *ill*ino (*in* and *lino*), *imm*ineo (*in* and *maneo*).

An exception is found in the preposition ἐν before ρ, as ἐνρίπτω, *I throw in;* yet in Latin *ir*ruo, not *in*ruo.

p-sound (π, β, φ) before μ passes into μ.
k- ,, (κ and χ) ,, μ ,, γ, but γ remains unchanged.
t- ,, (τ, δ, θ) ,, μ ,, σ: as—

1. *p*-sound,	τέ-τριβ-μαι,	from	τρίβω, *I rub*,	τέτριμμαι.
	λέλειπ-μαι	,,	λείπω, *I leave*,	λέλειμμαι.
	γέγραφ-μαι	,,	γράφω, *I write*,	γέγραμμαι.
2. *k*-sound.	πέπλεκ-μαι	,,	πλέκω, *I knit*,	πέπλεγμαι.
	λέλεγ-μαι	,,	λέγω, *I say*,	λέλεγμαι.
	βεβρεχ-μαι	,,	βρέχω, *I wet*,	βέβρεγμαι.
3. *t*-sound.	ἤνυτ-μαι	,,	ἀνύτω, *I finish*,	ἤνυσμαι.
	ἐρήρειδ-μαι	,,	ἐρείδω, *I support*,	ἐρήρεισμαι.
	πέπειθ-μαι	,,	πείθω, *I persuade*,	πέπεισμαι.
	κεκόμιδ-μαι	,,	κομίζω, *I carry*,	κεκόμισμαι.

N before a *p*-sound (π, β, φ, ψ) passes into μ.
,, ,, *k*- ,, (κ, γ, χ, ξ) ,, γ.
,, ,, *t*- ,, (τ, δ, θ) remains unchanged: as—

ἐν-πειρία	becomes	ἐμπειρία, *experience*.
ἐν-βάλλω	,,	ἐμβάλλω, *I cast into*.
ἔν-φρων	,,	ἔμφρων, *sensible, rational*.
ἔν-ψυχος	,,	ἔμψυχος, *animated*.
συν-καλέω	,,	συγκαλέω, *I call together*.
συν-γιγνώσκω	,,	συγγιγνώσκω, *I know with*.
σύν-χρονος	,,	σύγχρονος, *being at the same time*.
συν-ξέω	,,	συγξέω, *I smooth*.

Compare the Latin *imb*uo and *impr*imo. Nevertheless, we find συντείνω, *I stretch;* συνδέω, *I bind with;* and συνθέω, *I run with.*

The *enclitics*, or those words which receive a particle at the end, form an exception: as ὅνπερ (ὅν and περ), τόνγε (τόν and γε).

P-sound (π, β, φ) unites with σ to form ψ.
K- ,, (κ, γ, χ) ,, σ ,, ξ.
T- ,, (τ, δ, θ) before σ disappears; as—

1. *p*-sound.	λείπ-σω,	from	λείπω, *I leave*,	becomes	λείψω.
	τρίβ-σω	,,	τρίβω, *I rub*	,,	τρίψω.
	γράφ-σω	,,	γράφω, *I write*	,,	γράψω.
2. *k*-sound.	πλέκ-σω	,,	πλέκω, *I twist*	,,	πλέξω.
	λέγ-σω	,,	λέγω, *I say*	,,	λέξω.
	βρέχ-σω	,,	βρέχω, *I wet*	,,	βρέξω.
3. *t*-sound.	ἀνύτ-σω	,,	ἀνύτω, *I finish*	,,	ἀνύσω.
	ἐρείδ-σω	,,	ἐρείδω, *I support*	,,	ἐρείσω.
	πείθ-σω	,,	πείθω, *I persuade*	,,	πείσω.
	ἐλπίδ-σω	,,	ἐλπίζω, *I hope*	,,	ἐλπίσω.

Compare also, in the Latin, du*x*i, from du*c*o; re*x*i, from re*g*o; and co*x*i, from co*q*uo. As an exception, in the preposition ἐκ the κ before σ remains: as ἐκσώζω, *I save.*

N vanishes before σ, and if ν is connected with a *t*-sound both sounds vanish before σ; but the short vowel before the σ is lengthened—that is to say, ε into ει, ο into ου, and ᾰ, ῐ, ῠ into ᾱ, ῑ, ῡ: as—

δαίμον-σι	becomes	δαίμοσι.
τυφθέντ-σι	,,	τυφθεῖσι.
σπένδ-σω	,,	σπείσω.
ὀδόντ-σι	,,	ὀδοῦσι.
ἕλμινθ-σι	,,	ἕλμῖσι.
δεικνύντ-σι	,,	δεικνῦσι.

The following are exceptions:—ἐν, as ἐνσπείρω, *I sow in;* πάλιν, as παλίνσκιος, *thickly shaded;* some inflections in -σαι and -σις, as πέφανσαι, from φαίνω, *I show;* and a few substantives in -ινς and -υνς. The ν in συν in compounds before σ and a following vowel passes into σ, as συσσώζω; but if after ν a σ with a consonant or a ζ follows, then the ν disappears—as σύν-στημα, σύστημα; συν-ζύγια, συζύγια.

An exception to the extension of ε into ει before ν and a *t*-sound appears in the adjectives which end in -εις, -εσσα, -εν, the dative plural masculine and neuter of which is -εσι instead of -εισι.

Two immediately following syllables of a word cannot in certain cases begin with aspirates, but the first aspirate passes into the corresponding tenuis. This fact is exemplified in—

(1) The verbal reduplication: as—

Instead of	φε-φίληκα,	from	φιλέω, *I love*,	we have	πε-φίληκα.
,,	χέ-χῠκα	,,	χέω, *I pour*	,,	κέχυκα.
,,	θέ-θῠκα	,,	θύω, *I sacrifice*	,,	τέθυκα.
,,	θί-θημι	,,	(stem θε-), *I place*	,,	τίθημι.

(2) In the aorist and first future passive of the

two verbs **θύειν**, *to sacrifice*, and **τιθέναι**, *to place*: as—

> **ἐτύ-θην, τυ-θήσομαι, ἐτέ-θην, τε-θήσομαι,** instead of **ἐθύ-θην**, etc.

(3) In some words whose root begins with the aspirate θ and ends with an aspirate: for example—

ΘΡΙΧ-. θρίξ, τριχός, *hair;* but the dative plural is θριξίν.
ΘΑΧ-. ταχύς, *swift;* comparative θάττων.
ΘΑΦ-. θάπτω, *I bury;* 2 aor. pass. ἐτάφην.
ΘΡΕΦ-. τρέφω, *I nourish;* fut. θρέψω, aor. ἔθρεψα.

Here belongs also the verb **ἔχω**, *I have*, instead of **ἕχω**, fut. **ἕξω**; aor. **ἔσχον**, instead of **ἔσεχον**.

But in the passive or middle inflections beginning with θ of the verbs just mentioned (**θάπτω** and **τρέφω**), the aspirates remain: as—

ἐθρέφ-θην, θρεφ-θῆναι, θρεφ-θήσεσθαι, τεθράφ-θαι.
ἐθάφ-θην, θαφθείς, θαφ-θήσομαι, τεθάφ-θαι.

The two flectional terminations of the imperative first aorist passive would both begin with an aspirate, as **-θῆθι**, but the latter aspirate is changed into its tenuis, as **-θῆτι**; for example, **βουλεύ-θητι**. Nevertheless, the termination **-θι** appears in the second aorist passive, as **τρίβ-ηθι**.

Finally, the liquid ρ is doubled (1) with the augment, as **ἔρρεον**; (2) in compounds, when the ρ is preceded by a short vowel, as **ἄρρηκτος**, *unbroken, indestructible;* **βαθύρροος**, *flowing deep;* but **εὔρωστος** (from **εὐ** and **ῥώννυμι**, *I strengthen*), *very strong*, with only one ρ, since **ευ** is long.

FORMATION OF THE TENSES OF IMPURE VERBS.

Impure verbs are those whose characteristic is a consonant. They are divided into two classes—*Mute verbs* and *Liquid verbs*. *Impure* verbs differ from *pure* verbs in two ways: first, they in part form the second tenses (second aorist, second future, second perfect), and they in part undergo certain changes in the formation of their tenses—namely, first, a strengthening of the stem by consonants or by lengthening the vowel of the stem, and secondly, by a change of the vowel of the stem, which may be termed *conversion*.

MUTE VERBS.

Mute verbs have for their characteristic one of the nine mutes:—

π, β, φ; as, **βλέπω**, *I see;* **τρίβω**, *I rub;* **γράφω**, *I write.*
κ, γ, χ; as, **πλέκω**, *I knit;* **ἄγω**, *I lead;* **τεύχω**, *I make ready.*
τ, δ, θ; as, **ἀνύτω**, *I finish;* **ᾄδω**, *I sing;* **πείθω**, *I persuade.*

Many of these suffer certain changes in the stem or root. The stem of the verb, firstly, is strengthened. The characteristic consonant is strengthened; thus, **τύπ-ω** becomes **τύπ-τ-ω** by the addition of **τ** to the stem. In such verbs there are two characteristics and two kinds of stems, the *pure* and the *impure*. Thus, in **τύπ-τ-ω** the mute **π** is the pure characteristic, and **πτ** the impure characteristic; and **τυπ-** is the pure stem, while **τυπτ-** is the impure stem. In some cases the *k*-sound is converted into **ττ** or **σσ**, as **φρίττω** or **φρίσσω**, *I shudder*, the stem of which is the pure form **φρικ-**; or, in others, the *t*-sound is converted into ζ, as **φράζω**, *I publish*, from the pure stem **φραδ-**. These strengthened and impure stems remain in only the present and imperfect:—

Present.	*Imperfect.*	*Future.*
τύπ-τ-ω	ἔ-τυπ-τ-ον	τύπ-σ-ω (τύψω).
φρίσσω	ἔ-φρισσον	φρίκ-σ-ω (φρίξω).
φράζω	ἔ-φραζον	φράδ-σ-ω (φράσω).

The strengthening may be in the stem-vowel. When this strengthening occurs—

ă is changed into η.
ĭ ,, ῑ or ει.
ŭ ,, ῡ or ευ.

In this kind of verbs there is a division into *pure* and *impure* stems. The pure stem appears in the second aorist active, middle, and passive, as well as in the second future passive. For example:—

PURE STEM.

				Present.	*Future.*	*Perfect.*
ă	becomes	η	(2 aor. pass. ἐ-τάκ-ην)	τήκω	τήξω	τέτηκα.
ĭ	,,	ῑ	(2 aor. pass. ἐ-τρίβ-ην)	τρίβω	τρῖψω	τέτρῖφα.
ĭ	,,	ει	(2 aor. act. ἔ-λῐπ-ον)	λείπω	λείψω	λέλοιπα.
ŭ	,,	ῡ	(2 aor. pass. ἐ-φρῠ́γ-ην)	φρύγω	φρυξω.	
ŭ	,,	ευ	(2 aor. act. ἔ-φῠγ-ον)	φεύγω	φευξομαι	πέφευγα.

For every form of the verb which cannot be deduced from the present, another form of the present is assumed. For example, as **τύπτω** and **φεύγω** are the ordinary present tenses, yet cannot regularly give rise to certain derived tenses, so are **ΤΥΠΩ** and **ΦΥΓΩ** presented as *themes* or bases on which may be formed the second aorist passive **ἐ-τῠ́π-ην** and the second aorist active **ἔ-φῠγ-ον**. For the convenience of students these *themes* are printed in capitals.

CONVERSION OF THE STEM.

A second change which mute verbs undergo in their tense-formation consists in the change of the stem-vowel, which we call conversion—as, **κλέπτω**, *I steal*, 2 aor. passive **ἐ-κλάπ-ην**, 1 perf. **κέ-κλοφ-α**, where the **ε** of the present is converted into **ă** and **ο**. The converted vowel (conversion) appears only in the second tenses and some first perfects.

Most mute verbs, having a monosyllabic stem and ε for the stem-vowel, take in the second aorist active, middle, and passive, as well as in the second future passive, α as the converted vowel:—

τρέπ-ω, *I turn*, 2 aor. act. ἔ-τρᾰπ-ον.
κλέπτω, *I steal*, 2 aor. pass. ἐ-κλᾰ́π-ην.

This, however, is not always the case: as—

βλέπω, *I behold*, imperf. ἔ-βλεπ-ον, 2 aor. pass. ἐ-βλέπ-ην.

Some mute verbs with monosyllabic stems and ε for their stem-vowel take, in the second perfect and pluperfect, the conversion ο, and those which have ει in those syllables take the conversion οι. For example—

τρέφω, *I nourish*, τέτροφα.
λείπω, *I leave*, λέλοιπα.

The same conversion is taken by the following verbs in the first perfect, namely:—

κλέπτω, 1 perf. κέκλοφα (but perf. mid. or pass. κέκλεμμαι).
λέγω, 1 perf. συνείλοχα, ἐξείλοχα (but perf. mid. or pass. συνείλεγμαι).
πέμπω, 1 perf. πέπομφα (but perf. mid. or pass. πέπεμμαι).
τρέπω, 1 perf. τέτροφα, 2 perf. of τρέφω.
δείδω, *I fear*, 1 perf. δέδοικα.

The following three in the perfect and pluperfect middle or passive take as the conversion α, which does not pass into the first aorist passive:—

στρέφω, *I turn back*, perf. mid. or pass. ἔστραμμαι (but 1 aor. pass. ἐστρέφθην).
τρέπω, *I turn*, perf. mid. or pass. τέτραμμαι (but 1 aor. pass. ἐτρέφθην).
τρεφω, *I nourish*, perf. mid. or pass. τέθραμμαι (but 1 aor. pass. ἐθρέφθην).

REMARKS ON THE FORMATION OF THE SECOND TENSES.

All the second tenses are distinguished from the first tenses partly in this, that they lack the tense-characteristic, and consequently attach the person-endings (-ον, -ομην, -ην, -ησομαι, -α, and -ειν) immediately to the pure characteristic of the verb, as ἔ-λιπ-ον; partly in this (yet with the exception of the second perfect), that they are formed from *the pure unaltered verbal stem*—as, λείπ-ω, ἔ-λῐπ-ον; ψεύγ-ω, 2 aor. ἔ-φῠ-γον; and, again, in this, that they take the conversion—as, στρέφ-ω, ἐ-στράφ-ην. στραφ-ήσομαι, but ἐ-στρέφ-θην.

The second perfect lengthens either the short stem-vowel, as ᾰ into η (after ρ and vowels in ᾱ), or it retains the long vowel of the present: as—

κράζω, *I croak*,	2 a. act.	ἔ-κρᾰγ-ον,	2 perf.	κέ-κρᾱγ-α.
τήκω, *I melt*,	2 a. pass.	ἐ-τάκ-ην,	„	τέ-τη-κ-α.
φεύγω, *I flee*,	2 a. act.	ἔ-φυγ-ον,	„	πέ-φευγ-α.

Verbs which distinguish the second aorist active from the imperfect either not at all, or merely by the quantity of the stem-vowel, have no second aorist active and middle, though they have the second aorist passive, since the latter has a termination different from that of the imperfect: as—

γράφω, *I write*, imperf. ἔγραφον, 2 aor. act. and mid. wanting, 2 aor. pass. ἐγράφην.

DIVISION OF MUTE VERBS.

Mute verbs, like the mute letters, are divided into three classes, according to their predominant letter. In each of these three classes are verbs with pure and verbs with impure characteristic in the present and imperfect.

(1) Verbs whose characteristic is a *p*-sound (π, β, φ, *pure;* ττ *impure*):—

(*a*) *Pure Characteristic.*—βλέπ-ω, *I see;* τρίβ-ω, *I rub;* γράφ-ω, *I write.*
(*b*) *Impure Characteristic.*—τύπτ-ω, *I strike* (pure characteristic π, pure stem ΤΥΦ-); βλάπτ-ω, *I injure* (β, ΒΛΑΒ-); ῥίπτ-ω, *I cast* (φ, ΡΙΦ-).

(2) Verbs whose characteristic is a *k*-sound (κ, γ, χ, *pure;* ττ or σσ, *impure*):—

(*a*) *Pure Characteristic.*—πλέκ-ω, *I plait;* ἄγ-ω, *I drive;* τεύχ-ω, *I frame.*
(*b*) *Impure Characteristic.*—φρίσσ-ω (Att. φρίττω), *I shudder* (pure characteristic κ, pure stem ΦΡΙΚ-); τάσσ-ω (Att. τάττ-ω), *I set in order* (γ, ΤΑΓ-); βήσσ-ω (Att. βήττ-ω), *I cough* (χ, ΒΗΧ-).

(3) Verbs whose characteristic is a *t*-sound (τ, δ, θ, *pure;* ζ, *impure*): as—

(*a*) *Pure Characteristic.*—ἀνύτ-ω, *I end;* ᾀδ-ω, *I sing;* πείθ-ω, *I persuade.*
(*b*) *Impure Characteristic.*—φράζ-ω, *I say* (pure characteristic δ, pure stem ΦΡΑΔ-).

Some verbs ending in -ττω or -σσω have for their pure characteristic not a *k*-sound, but a *t*-sound: as, ἁρμόττω, *I adapt, put together*, fut. -όσω; ἐρέσσω, *I steer;* πάσσω, *I bestrew;* πλάσσω, *I form;* πτίσσω, *I pound.* The verb νάσσω, *I press together*, has both formations: as, fut. νάξω, etc., perf. mid. or pass. νένασμαι, verbal adj. ναστός.

Many verbs in -ζω, which for the most part express a *sound* or *call*, have for their pure characteristic not a *t*-sound, but a *k*-sound, commonly γ: for example, αἰάζω, *I lament* (cry αι! αι!); ἀλαλάζω, *I shout the war-cry;* κοΐζω, *I grunt* (like a pig); κράζω, *I croak* (like a raven); μαστίζω, *I whip;* ὀδάζω, *I bite;* οἰμώζω (fut. -ξομαι), *I bewail* (cry οι! οι!).

The following in -ζω have both formations:—

βαστάζω, *I carry*, fut. -άσω, etc., aor. pass. ἐβαστάχθην; νυστάζω, *I nod, am drowsy*, fut. -άσω and -άξω; παίζω, *I play, joke*, fut. παιξοῦμαι and παίξομαι, aor. ἔπαισα; perf. mid. or pass. πέπαισμαι.

The following three in -ζω have for their pure characteristic γγ, namely:—κλάζω, *I sound, I clang*, 2 perf. κέκλαγγα, fut. κλάγξω, aor. ἔκλαγξα; πλάζω, *I mislead, lead astray*, fut. πλάγξω, etc.; σαλπίζω, *I sound a trumpet*, fut. σαλπίγξω, etc.

FORMATION OF THE TENSES IN MUTE VERBS.

The first perfect and pluperfect active change a *p*-sound or a *k*-sound for the corresponding aspirate: *e.g.*—

p-sound τρίβω, τέτριβα (τέτριφα),
k-sound πλέκω, πέπλεκα (πέπλεχα);

but have the terminations -κα, -κειν, when the characteristic is a *t*-sound; though the *t*-sound disappears before κ—as πέ-πει-κα, from πείθ-ω.

The vowels α, ι, υ in verbs having a *t*-sound as characteristic are short before the terminations with the tense-characteristics σ and κ (-κα, -κειν), as:—φράζω, φράσω, ἔφρᾰσα, πέφρᾰκα. In the same way, short vowels remain short, as ἁρμόζω, *I fit*, ἥρμοκα.

When μ precedes a *p*-sound as the characteristic (as, for example, in πέμπω, *I send*) μ is thrown out before the terminations beginning with μ in the perfect middle or passive, as πέ-πεμ-μαι instead of (πέ-πεμπ-μαι) πέ-πεμμ-μαι; κάμπτω, *I bend*, κέ-καμ-μαι instead of (κέ-καμπ-μαι) κέκαμμ-μαι. So when μ is preceded by γγ, one γ vanishes, as σφίγγω, *I lace*, ἔ-σφιγ-μαι (instead of ἔ-σφιγγ-μαι). ἔσφιγξαι, ἔσφιγκται; inf. ἐσφίγχθαι, part. ἐσφιγμένος.

Verbs whose characteristic is a *t*-sound do not, in ordinary speech, form the second aorist.

The terminations beginning with σθ after an immediately preceding mute lose the σ, whereon the mute assumes the aspirated form in consequence of the following θ, as κεκρύφθαι, instead of κεκρύψθαι (that is, κεκρύπ-σθαι).

The third person plural perfect and pluperfect, middle or passive, which properly ends in -νται and -ντο, cannot in the impure, both mute and liquid, be so formed, on account of the coming together of so many consonants. Consequently, the person is commonly expressed with the aid of the plural of the participle perfect middle or passive and of the third person plural present and imperfect of the verb εἶναι (εἰσί, *are*, and ἦσαν, *were*). Sometimes, however, the ν is represented by ᾰ (according to the rule referred to above, by which ν after a consonant is vocalised), which, after a *k*-sound and *p*-sound, is aspirated, but remains unaspirated after a *t*-sound: as—

		Third Plural	instead of	*Pluperfect.*
τρίβ-ω	τέ-τριμ-μαι	τετρίφᾰται	(τέτριβνται)	ἐτετρίφᾰτο.
πλέκ-ω	πέ-πλεγ-μαι	πεπλέχᾰται	(πέπλεκνται)	ἐπεπλέχᾰτο.
τάττ-ω	τέ-ταγ-μαι	τετάχᾰται	(τέταγνται)	ἐτετάχᾰτο.
χωρίζ-ω	κε-χωρισ-μαι	κεχωρίδᾰται	(κεχωριδνται)	ἐκεχωρίδᾰτο.
φθείρ-ω	ἔ-φθαρ-μαι	ἐφθάρᾰται	(ἔφθαρνται)	ἐφθάρᾰτο

PARADIGMS OF MUTE VERBS.

(1) VERBS WHOSE CHARACTERISTIC IS A *p*-SOUND (π, β, φ).

(*a*) *Pure Characteristic* π, β, φ; *fut.* -ψω.

ACTIVE VOICE.

Pres. ind. τρίβ-ω, *I rub*, subj. τρίβ-ω, imp. τρῖβ-ε, inf. τρίβ-ειν, part. τρίβ-ων.

Imperf. ind. ἔ-τρῖβ-ον, opt. τρίβ-οιμι.

Fut. ind. (τρίβ-σω) τρίψω, opt. τρίψοιμι, inf. τρίψειν.

1 Aor. ind. ἔ-τριψα, subj. τρίψω, opt. τρίψαιμι, imp. τρῖψον, inf. τρῖψαι, part. τρίψας.

1 Perf. ind. (τέ-τρῖβ-α) τέ-τρῖφ-α, subj. τε-τρίφ-ω imp. τέ-τρῖφ-ε, inf. τε-τρῖφ-έναι, part. τε-τρῖφ-ώς

1 Plup. ind. (ἐ-τε-τρίβ-η) ἐ-τε-τρίφ-η.

MIDDLE VOICE.

Pres. ind. τρίβομαι.

Imperf. ind. ἐ-τρῖβ-όμην.

Fut. ind. τρίψομαι.

1 Aor. ind. ἐτριψάμην.

Perf. ind. τέ-τρι-μμαι, -ψαι, -πται, etc.; imp. τέ-τρι-ψο, -φθω, etc.; inf. τε-τρί-φθαι; part. τε-τριμ-μένος; subj. τε-τριμ-μένος ὦ; opt. τε-τριμ-μένος εἴην.

Plup. ἐ-τε-τρίμ-μην, -ψο, -πο, etc.

3 Fut. ind. τε-τρίψομαι.

PASSIVE VOICE.

1 Aor. ind. (ἐ-τρίβ-θην) ἐ-τρίφ-θην.

1 Fut. ind. τριφ-θήσομαι.

2 Aor. ind. ἐ-τρίβ-ην.

2 Fut. ind. τρῐβ-ήσομαι.

Verbal Adj. (τριβ-τός) τριπ-τός, -ή, -όν; τριπ-τέος, -έα, -έον.

N.B.—The ι *in* τρίβω *is long, except in the perfect and second aorist, and in compounds formed from the second aorist.*

(*b*) *Impure Characteristic* πτ; *fut.* -ψω.

	Active.	*Middle.*	*Passive.*
Pres.	κόπτω, *I knock.*	κόπτομαι.	
1 Perf.	κέκοφα.	κέκομμαι (like τέτριμμαι).	
2 Perf.	κέ-κοπα (Hom.).		1 Aor. ἐκόφθην.
Fut.	κόψω.	κόψομαι.	1 Fut. κοφθήσομαι.
1 Aor.	ἔκοψαι	ἐκοψάμην.	2 Aor. ἐκόπην.
3 Fut.		κεκόψομαι.	2 Fut. κοπήσομαι.

Verbal Adj. κοπτός, κοπτέος.

So conjugate κάμ-π-τ-ω, *I bend*, fut. κάμψω, aor. ἔκαμψα, perf. mid. or pass. κέκαμμαι (instead of κέκαμμ-μαι).

EXERCISE IN PARSING.

Give the parts and the meaning, and explain the formation of—

Κέκαμμαι. κεκαμμένοι εἰσίν. τρέπω. κεκόψομαι. τέτριψαι. τρίψαιμι. τετριψοίμην. τριπτέος. ἔσφιγμαι. κεκωρίδăται. ἔκρăγον. κέκρāγα. ἔλιπον. ἔγραφον. ἐσφιγμένος. ἥρμοκα.

VOCABULARY.

Αἰών, -ῶνος, ὁ καὶ ἡ, age, an age.
'Αλείφω, I anoint; ἐξαλείφω, I blot out.
'Επαμεινώνδας, -ου, ὁ, Epaminondas.
Εὐριπίδης, -ου, ὁ, Euripides.
Θάπτω, I bury; συνθάπτω, I bury with *or* at the same time.
Θηβαῖος, -ου, ὁ, a Theban.
Καλύπτω, I hide; κρύπτω, I conceal.
Καταλείπω, I leave, I leave behind.
Πρεσβεύτης, -ου, ὁ, a messenger; *in the plur.* οἱ πρεσβεῖς, -έων.
Προλείπω, I abandon.
'Ρίπτω, I cast.
Φαίνω, I show.
Φθόνος, -ου, ὁ, envy.

EXERCISE 103.

Translate into English:—

1. 'Ο παῖς τὴν ἐπιστολὴν ἐγεγράφη. 2. Οἱ πολέμιοι πρεσβεῖς εἰς τὴν πόλιν ἔπεμψαν. 3. Τὰς τῶν σπουδαίων φιλίας οὐδ' ἂν ὁ πᾶς αἰὼν ἐξαλείψειεν. 4. Πολλάκις ὀργὴ ἀνθρώπων νοῦν ἐξεκάλυψεν. 5. Τῷ 'Επαμεινώνδου σώματι συνέθαψε τὴν δύναμιν τῶν Θηβαίων ὁ καιρός. 6. Εὐριπίδης ἐν Μακεδονίᾳ τέθαπται. 7. Θεὸς τοῖς ἀνθρώποις τὸ μέλλον κεκάλυφεν. 8. 'Ακούσας καλὸν μέλος τερφθείης ἄν. 9. Οἱ στρατιῶται τὰς τάξεις κατέλιπον.

N.B.—The optative with ἄν *sometimes expresses possibility; and the aorist is used of constantly repeated actions in a "gnomic" (or "proverbial") sense, where in English we should use the present.*

EXERCISE 104.

Translate into Greek:—

1. The letter has been written by the boy. 2. The boy wrote the letter. 3. The boys have written the letter. 4. Ambassadors were sent into the city by the enemy. 5. Wine often shows what man has concealed in his heart. 6. The future has been hidden from men by God. 7. The Lacedæmonians brought up their children in rough customs. 8. A beautiful song delights us. 9. The enemy destroyed the city.

KEY TO EXERCISES.

Ex. 93.—1. True beauty, which takes its source from divine communion, neither toil nor hunger, nor any neglect (on the one hand) nor time (on the other) wastes away. 2. Friendships (*i.e.*, *friends*) seek to assimilate habits. 3. You could hardly make your praises equal to the virtues of the good. 4. O boy, emulate good and prudent men. 5. Fortune often restores those who are in evil plight. 6. A multitude of troubles darkens the life of man. 7. Let young men strive after wisdom.

Ex. 94.—1. 'Αμαυροῖς τὸ σθένος. 2. 'Αμαυροῖ το σθένος. 3. Οἱ παῖδες τὰ γράμματα ζητοῖεν. 4. 'Ο πλοῦτος ἀνθρώπους τυφλοῖ. 5. 'Ηλευθέρου τοὺς αἰχμαλώτους. 6. 'Ελευθεροῦσι τοὺς παῖδας. 7. 'Ηλευθερους τὸν πατέρα αἰχμάλωτον. 8. Τοὺς κακοὺς πολίτας ὀρθοῖ. 9. 'Η ἀμέλεια τοῦ βίου τοὺς ἀνοήτους τυφλοῖ. 10. 'Ετυφλούτην τοὺς φίλους.

Ex. 95.—1. When you are unable to use your wealth, in what respect do you differ from a poor man? 2. A kind word heals sorrow. 3. All mortals are pleased by being honoured. 4. Men contrive many things. 5. He is happy who hath means with prudence, for he uses them well. 6. The good man is honoured by all. 7. The couriers did not use sandals on their journeys.

Ex. 96.—1. 'Ηκροῶ. 2. 'Ηκροῶντο. 3. 'Ηκροᾶτο. 4. 'Ακροᾶται. 5. Μηχανῶνται. 6. 'Εμηχανῶντο. 7. Χρῆται. 8. Χρῆσθον. 9. Χρῶνται. 10. 'Εχρῶ. 11. 'Εχρῆτο. 12. 'Εχρῶντο. 13. 'Αδυνατεῖς τῇ σῇ οὐσίᾳ σοφῶς χρῆσθαι. 14. Μακάριοί εἰσιν οἱ τῇ οὐσίᾳ σοφῶς χρῶνται.

Ex. 97.—1. Make the good man a companion. 2. It behoves the strong man to be gentle, that his neighbours may reverence rather than fear him. 3. Tattlers are disbelieved, even though they speak the truth. 4. The Persians were hated and despised by the Greeks. 5. He who does no wrong needs no law. 6. Troy was besieged by the Greeks for ten years. 7. Let no one fear death, the end of evils.

Ex. 98.—1. Μὴ καταφρονεῖτε ἀλλήλους. 2. 'Απιστοῦνται. 3. Καταφρονεῖς τοὺς κακούς. 4. Καταφρονῶν κατεφρονεῖτο. 5. 'Αδικεῖ. 6. Οἱ ἀδικοῦντες ἀδικοῦνται αὐτοί. 7. Φοβοῦνται θάνατον, ἀπόλυσιν κακῶν. 8. Οἱ πολῖται φοβοῦνται μὴ ἡ πόλις πολιορκῆται. 9. Αληθεύουσιν.

Ex. 99.—1. We are slaves to the flesh and the passions. 2. We free our friends, but subdue our foes. 3. Be not proud of thy wisdom, thy strength, or thy wealth. 4. May he who is high-minded be humbled. 5. Those who oppose good men deserve to be punished. 6. The soldiers were enslaved by the barbarians. 7. May all bad men be punished.

Ex. 100.—1. Οἱ κακοὶ τῇ σαρκὶ δουλοῦνται. 2. Σὺ ἐλευθεροῖς τοὺς ἐχθρούς, ἐκεῖνοι οὐκ ἐλευθεροῦσι τοὺς φίλους. 3. Γαυροῦται τῇ οὐσίᾳ. 4. Οἱ κακοὶ ἐναντιοῦνται τοῖς ἀγαθοῖς, οἱ δὲ ἀγαθοὶ μακάριοί εἰσιν. 5. 'Εζημιοῦντο. 6. Ζημιοῦνται. 7. 'Εζημιούμεθα. 8. 'Εζημιοῦσθε. 9. 'Ο γαυρώμενος τῷ πλούτῳ ταχὺ ταπεινοῖτο.

Ex. 101.—1. Leonidas and his men died fighting bravely. 2. Fortune has restored many in adversity. 3. Fortune trips up those whom she has exalted. 4. All things are easy for God to accomplish. 5. Never allow unskilful men to judge. 6. The poet has made Ulysses, the most eloquent (of men), the most silent. 7. Good men will adorn their country. 8. Many who have acquired great wealth still do not use it out of stinginess. 9. The couriers did not use sandals upon their journeys. 10. The physicians will heal the wounds. 11. The tongue which has acquired seasonable silence brings honour both to young and old. 12. No one gained praise by pleasures.

Ex. 102.—1. Οἱ ἀγαθοὶ τοὺς ἀγαθοὺς ἀγαπῶσι καὶ τιμῶσιν. 2. Οἱ γενναῖοι νεανίαι τῇ ἀρετῇ ἀκολουθήσουσιν. 3. 'Αλέξανδρος ὁ τῶν Μακεδόνων βασιλεὺς ἐνίκησε Δαρεῖον τὸν τῶν Περσῶν βασιλέα. 4. Οἱ πολῖται τὸν στρατηγὸν μεγάλης τίμης ἠξίωσαν. 5. 'Ο πόλεμος τὴν πόλιν πολλῶν πολιτῶν ἐχήρωσεν. 6. Οἱ πολέμιοι ἐνικήθησαν. 7. Οἱ ἰατροὶ τὸ ἕλκος ἠκέσαντο. 8. Οὐδεὶς ἔπαινον ταῖς ἡδοναῖς κτήσεται. 9. Πάντα εὖ τετέλεσται.

SPANISH.—IX.

[*Continued from Vol. VII., p.* 373.]

CONJUGATIONS OF REGULAR VERBS (*continued*).

THE PASSIVE VERB (*continued*).

INSTEAD of employing the auxiliary verb *ser* (to be), and the participle of the verb agreeing with its nominative, the personal reflective pronoun *se* is often used in the third person singular and plural with the proper tense of the active verb. Thus, we may say, el libro ha sido hallado, *or* el libro se ha hallado (literally, *the book has found itself*), and both forms are to be rendered in English, *the book has been found*. This is a very important rule of Spanish grammar, and must be kept in mind by the student.

VOCABULARY.

Abrir,	*to open.*
Botella,	*bottle.*
Clamor,	*noise, clamour.*
Continuar,	*to continue.*
Creer,	*to believe, to think.*
Doblar,	*to double, to increase.*
Engañar,	*to deceive.*
Escuela,	*school.*
Humo,	*smoke.*
Llamar,	*to call, to name.*
Llenar,	*to fill*
Profecia,	*prophecy.*
Puerta,	*door.*
Usar,	*to use.*
Vender,	*to sell.*

In many of the following sentences the nominative will be found placed after the verb, this being a very common order of construction in Spanish, especially in sentences in which *se*, with the active verb, is used in place of the passive verb.

EXERCISE 34.

Translate into English :—

1. Esta muger se llama María. 2. Se cree. 3. Este vino se vende á tres pesos la botella. 4. Se enagaña V. 5. ¿ Qué libros se usan en esa escuela? 6. Las botellas se llenarán de ágna. 7. Se llenó toda la ciudad de humo. 8. Aquí se habla el Frances. 9. Se abrirá la puerte. 10. Las casas se quemaron. 11. Aquí se venden libros. 12. Se cumplen las profecías. 13. Este hombre se llama Pedro.

EXERCISE 35.

Translate into Spanish :—

1. Here French is spoken. 2. Knock (*llamád*), and it shall be opened to you. 3. The clamour is doubled. 4. Are gold pens used? 5. The bottles will be filled with (*de*) wine. 6. The house will be filled with smoke. 7. The doors will be opened. 8. The prophecy is fulfilled. 9. The houses are burned. 10. Here books are sold (pres.). 11. This wine is sold at two shillings a bottle. 12. The letter will be continued. 13. All the gates were opened (perf. def.).

The passive verb is sometimes formed by the auxiliary verb *estar*, instead of *ser*, as :—El caballo está lastimado, *the horse is injured;* la casa está mal construida, *the house is badly built.*

Verbs are conjugated interrogatively, by placing the pronoun after the verb; and negatively, by placing the adverb *no* before the verb; as:—

¿ Amo yo? *love I?* or *do I love?* El nó come, *he does not eat.*

If an objective pronoun come before the verb, the negative *no* is then placed immediately before such pronoun, as :—

¿ No lo habeis oido? *have ye not heard it?*
Yo no le vi, *I saw him not.*

One of the most important rules in Spanish syntax is that by which a noun in the objective case, if it be a person, or inanimate thing personified, and the direct object of a verb, is to be preceded by the preposition *á*. Thus "John loves his brother" would be in Spanish, *Juan ama á su hermano*, and not *Juan ama su hermano;* "Peter slew the barber" would be, *Pedro mató* al *barbero,** and not *Petro mató el barbero.*

VOCABULARY.

Deudor,	*debtor.*
Honrar,	*to honour.*
Matar,	*to slay, to kill.*
Noche (fem.),	*night.*
Perdonar,	*to forgive, to pardon.*
Recompensar,	*to reward.*
Robar,	*to rob.*
Sanar,	*to heal, to cure.*
Temer,	*to fear.*
Visitar,	*to visit.*

EXERCISE 36.

Translate into English :—

1. El padre ama á sus hijos. 2. El médico sana á los enfermos. 3. Perdonamos á nuestros deudores. 4. Dios ama á los que son buenos. 5. Ella tema al Americano. 6. El juez perdonó al hombre que robo al padre de Pedro. 7. Mi criado mató á su padre. 8. Perdoné á todos mis deudores. 9. Pedro me ama como á un hermano. 10. Visitaremos al presidente esta noche (*to-night*). 11. Recompensaré al que me honra.

EXERCISE 37.

Translate into Spanish :—

1. We honour the judge. 2. This judge fears not God. 3. I forgive my debtors. 4. They called the painters. 5. The physician will heal many sick (persons). 6. They robbed the woman whom we rewarded. 7. Honour ye your parents (*padres*). 8. I love thee like (*como*) a father. 9. The ladies will reward their female servants.

IRREGULAR VERBS.

The irregular verbs in Spanish are such as do not conform exactly in their manner of conjugation to the model verbs (*amar*, *comer*, *vivir*). The deviations of each irregular verb are in most cases but slight, yet important to be known, as most of the irregular verbs are in general use.

There are thirty-nine of the different irregular verbs: seven of the first conjugation, seventeen of the second, and fifteen of the third. Many of these differ but very slightly from each other. All the irregular verbs are conjugated like some one of these thirty-nine forms. Four of these—viz., *haber*, *ser*, *estar*, and *tener*—have already been conjugated.

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* This rule applies only to rational beings or personified objects; thus we cannot say, *amo á la verdad,* but *amo la verdad,* "I love the truth."

Those verbs which undergo slight changes in the verb-roots or verb-endings of certain tenses or persons of tenses are not on that account deemed irregular, since these changes take place solely to preserve *regularity* and uniformity of sound, which would be dissimilar in some cases if these changes did not take place. Both regular and irregular verbs undergo such changes when required by the rules of pronunciation.

Remark.—In the following conjugations of the irregular verbs, those persons of the moods and tenses only which deviate from the regular conjugation are given. Thus, in the first verb, *andar*, no tense of the indicative mood except the perfect definite is given, because this verb is conjugated regularly in the other tenses of this mood. The student is therefore to remember that all moods, tenses, and persons not included in the conjugation are regular. We have, however, in all cases given the participle and gerund, whether formed regularly or not.

IRREGULAR VERBS OF THE FIRST CONJUGATION.

1. The irregular verb *andar*, to walk, is thus conjugated:—

Inf. *Past Participle.* Andado.—*Gerund.* Andando.

Ind. *Perfect Definite.* Anduve, anduviste, anduvo; anduvimos, anduvisteis; anduvieron.

Sub. *Imperfect.* Anduviera *or* anduviese, anduvieras *or* anduvieses, anduviera *or* anduviese; anduvieremos *or* anduviesemos, anduviérais *or* anduviéseis, anduvieran *or* anduviesen —*First Future.* Anduviere, anduvieres, anduviere, anduvieremos, anduviereis, anduvieren.

2. The irregular verb *contar*, to relate, is thus conjugated:—

Inf. *Past Participle.* Contado.—*Gerund.* Contando.

Ind. *Present.* Cuento, cuentas, cuenta; ——, ——, cuentan

Imp. Cuente, cuenta, cuente; ——, ——, cuenten.

Sub. *Present.* Cuente, cuentes, cuente; ——, ——, cuenten.

This verb changes *o* of the verb-root into *ue*, in the three persons singular and third person plural of the present indicative, imperative, and present subjunctive.

3. The irregular verb *dar*, to give, is thus conjugated:—

Inf. *Past Participle.* Dado.—*Gerund.* Dando.

Ind. *Present.* Doy (*no other Persons irregular*).—*Perfect Definite.* Di, diste, dió; dimos, disteis, dieron.

Sub. *Imperfect.* Diera *or* diese, dieras *or* dieses, diera *or* diese; diéramos *or* diésemos, diérais *or* diéseis, dieran *or* diesen. —*First Future.* Diere, dieres, diere; dieremos, diéreis, dieren.

4. The irregular verb *jugar*, to play, is thus conjugated:—

Inf. *Past Participle.* Jugado.—*Gerund.* Jugando.

Ind. *Present.* Juego, juegas, juega; ——, ——, juegan.

Imp. Juegue, juega, juegue; ——, ——, jueguen.

Sub. *Present.* Juegue, juegues, juegue; ——, ——, jueguen.

This verb takes *e* before *g* of the verb-root in the three persons singular and third person plural of the present indicative, the imperative, and present subjunctive.

5. The irregular verb *tentar*, to try, to tempt, is thus conjugated:—

Inf. *Past Participle.* Tentado.—*Gerund.* Tentando.

Ind. *Present.* Tiento, tientas, tienta; ——, ——, tientan.

Imp. Tiente, tienta, tiente; ——, ——, tienten.

Sub. *Present.* Tiente, tientes, tiente; ——, ——, tienten.

This verb takes *i* before *e* of the verb-root in the same persons and tenses as are irregular in the preceding verb.

6. The irregular verb *errar*, to err, is thus conjugated:—

Inf. *Past Participle.* Errado.—*Gerund.* Errando.

Ind. *Present.* Yerro, yerras, yerra; ——, ——, yerran

Imp. Yerre, yerra, yerre; ——, ——, yerren.

Sub. *Present.* Yerre, yerres, yerre; ——, ——, yerren.

This verb is irregular in the same persons and tenses as *tentar*, and takes *y* before *e* of the verb-root in all the irregular persons.

IRREGULAR VERBS OF THE SECOND CONJUGATION.

7. The irregular verb *caber*, to be contained, to have room, is thus conjugated:—

Inf. *Past Participle.* Cabido.—*Gerund.* Cabiendo.

Ind. *Present.* Quepo (*no other Persons irregular*).—*Perfect Definite.* Cupe, cupiste, cupo; cupimos, cupisteis, cupieron.—*First Future.* Cabre, cabras, cabrá; cabremos, cabréis, cabrán.

Imp. Quepa, ——, quepa; quepamos, ——, quepan.

Sub. *Present.* Quepa, quepas, quepa; quepamos, quepáis, quepan.—*Imperfect.* Cupiera, cabría, *or* cupiese; cupieras, cabrías, *or* cupieses; cupiera, cabría, *or* cupiese. Cupiéramos, cabríamos, *or* cupiesemos; cupiérais, cabríais, *or* cupiéseis; cupieran, cabrian, *or* cupiesen.—*First Future.* Cupiere, cupieres, cupiére; cupiéremos, cupiéreis, cupieren.

8. The irregular verb *caer*, to fall, is thus conjugated:—

Inf *Past Participle.* Caido.—*Gerund.* Cayendo.

Ind. *Present.* Caigo (*no other Persons irregular*).

Imp. Caiga, ——, caiga; caigamos, ——, caigan.

Sub. *Present.* Caiga, caigas, caiga; caigamos, caigáis, caigan.

This verb takes *ig* after the verb-root in the first person singular of the present indicative, in the first and third persons singular and plural of the imperative, and in all the persons of the present subjunctive.

9. The irregular verb *hacer*, to make, to do, is thus conjugated:—

Inf. *Past Participle.* Hecho.—*Gerund.* Haciendo.

Ind. *Present.* Hago (*no other Persons irregular*).—*Perfect Definite.* Hice, hiciste, hizo; hicimos, hicisteis, hicieron.—*First Future.* Haré, harás, hará; haremos, haréis, harán.

Imp. Haga, haz, haga; hagamos, ——, hagan.

SUB. *Present.* Haga, hagas, haga; hagamos, hagáis, hagan.—*Imperfect.* Hiciera, haría, *or* hiciese; hicieras, harías, *or* hicieses; hiciera, haría, *or* hiciese. Haciéramos, haríamos, *or* hiciésemos; hiciérais, haríais, *or* hiciéseis; hicieran, harían, *or* hiciesen.—*First Future.* Hiciere, hicieres, hiciere; hiciéremos, hiciéreis, hicieren.

Satisfacer, one of the compounds of the verb *hacer*, has in the second person singular of the imperative mood both *satisfaz* and *satisface.*

10. The irregular verb *mover*, to move, is thus conjugated:—

INF. *Past Participle.* Movido.—*Gerund.* Moviendo.
IND. *Present.* Muevo, mueves, mueve; ——, ——, mueven.
IMP. Mueva, mueve, mueva; ——, ——, muevan.
SUB. *Present.* Mueva, muevas, mueva; ——, ——, muevan.

This verb changes *o* of the verb-root into *ue* in the three persons singular and third person plural of the present indicative, the imperative, and present subjunctive.

11. The irregular verb *oler*, to smell, is thus conjugated:—

INF. *Past Participle.* Olido.—*Gerund.* Oliendo.
IND. *Present.* Huelo, hueles, huele; ——, ——, huelen.
IMP. Huela, huele, huela; ——, ——, huelan.
SUB. *Present.* Huela, huelas, huela; ——, ——, huelan.

This verb changes as the preceding, and also takes *h* at the beginning of the irregular persons.

12. The irregular verb *parecer*, to seem, is thus conjugated:—

INF. *Past-Participle.* Parecido.—*Gerund.* Pareciendo.
IND. *Present.* Parezco (*no other Persons irregular*).
IMP. Parezca, ——, parezca; parezcamos, ——, parezcan.
SUB. *Present.* Parezca, parezcas, parezca; parezcamos, parezcáis, parezcan.

This verb, and all others ending in *-acer*, *-ecer*, and *-ocer* (except *hacer* and *cocer*, and, of course, their compounds), take *z* before *c* of the verb-root when the verb-ending begins with *a* or *o*. This can only occur in the first person singular of the present indicative, the first and third persons singular and plural of the imperative, and all the persons of the present subjunctive.

13. The irregular verb *poder*, to be able, is thus conjugated:—

INF. *Past Participle.* Podido.- *Gerund.* Pudiendo.
IND. *Present.* Puedo, puedes, puede; ——, ——, pueden.—*Perfect Definite.* Pude, pudiste, pudo; pudimos, pudísteis, pudieron.—*First Future.* Podré, podrás, podrá; podremos, podréis, podrán.
SUB. *Present.* Pueda, puedas, pueda; ——, ——, puedan.—*Imperfect.* Pudiera, podría, *or* pudiese; pudieras, podrías, *or* pudieses; pudiera, podría, *or* pudiese. Pudiéramos, podríamos, *or* pudiésemos; pudiérais, podríais, *or* pudiéseis; pudieran, podrían, *or* pudiesen.—*First Future.* Pudiere, pudieres, pudiere; pudiéremos, pudiéreis, pudieren.

14. The irregular verb *poner*, to place, to put, is thus conjugated:—

INF. *Past Participle.* Puesto.—*Gerund.* Poniendo.
IND. *Present.* Pongo (*no other Persons irregular*).—*Perfect Definite.* Puse, pusiste, puso; pusimos, pusísteis, pusieron.—*First Future.* Pondré, pondrás, pondrá; pondremos, pondréis, pondrán.
IMP. Ponga, pon, ponga; pongamos, ——, pongan.
SUB. *Present.* Ponga, pongas, ponga; pongamos, pongáis, pongan.—*Imperfect.* Pusiera, pondría, *or* pusiese; pusieras, pondrías, *or* pusieses; pusiera, pondría, *or* pusiese. Pusiéramos, pondríamos, *or* pusiésemos; pusiérais, pondrías, *or* pusiéseis; pusieran, pondrían, *or* pusiesen.—*First Future.* Pusiere, pusieres, pusiere; pusiéremos, pusiéreis, pusieren.

15. The irregular verb *querer*, to be willing, to wish, is thus conjugated:—

INF. *Past Participle.* Querido.—*Gerund.* Queriendo.
IND. *Present.* Quiero, quieres, quiere; ——, ——, quieren.—*Perfect Definite.* Quise, quisiste, quiso; quisimos, quisísteis, quisieron.—*First Future.* Querre, querras, querrá; querremos, querréis, querrán.
IMP. Quiera, quiere, quiera; ——, ——, quieran.
SUB. *Present.* Quiera, quieras, quiera; ——, ——, quieran.—*Imperfect.* Quisiera, querria, *or* quisiese; quisieras, querrías, *or* quisieses; quisiera, querría, *or* quisiese. Quisiéramos, querríamos, *or* quisiésemos; quisiérais, querriais, *or* quisiéseis; quisieran, querrían, *or* quisiesen.—*First Future.* Quisiere, quisieres, quisiere; quisiérémos, quisiéreis, quisieren.

16. The irregular verb *saber*, to know, is thus conjugated:—

INF. *Past Participle.* Sabido.—*Gerund.* Sabiendo.
IND. *Present.* Sé (*no other Persons irregular*).—*Perfect Definite.* Supe, supiste, supo; supimos, supísteis, supieron.—*First Future.* Sabré, sabrás, sabrá; sabremos, sabréis, sabrán.
IMP. Sepa, ——, sepa; sepamos, ——, sepan.
SUB. *Present.* Sepa, sepas, sepa; sepamos, sepais, sepan.—*Imperfect.* Supiera, sabría, *or* supiese; supieras, sabrías, *or* supieses; súpiera, sabría, *or* supiese. Supiéramos, sabríamos, *or* supiésemos; supiérais, sabríais, *or* supiéseis; supieran, sabrían, *or* supiesen.—*First Future.* Supiere, supieres, supiere; supieremos, supiereis, supieren.

17. The irregular verb *tender*, to tend, to extend, is thus conjugated:—

INF. *Past Participle.* Tendido.—*Gerund.* Tendiendo.
IND. *Present.* Tiendo, tiendes, tiende; ——, ——, tienden.
IMP. Tienda, tiende, tienda; ——, ——, tiendan.
SUB. *Present.* Tienda, tiendas, tienda; ——, ——, tiendan.

18. The irregular verb *traer*, to bring, to carry, is thus conjugated:—

INF. *Past Participle.* Traido.—*Gerund.* Trayendo.
IND. *Present.* Traigo (*no other Persons irregular*).—*Perfect Definite.* Traje, trajiste, trajo; trajimos, trajisteis, trajeron.
IMP. Traiga, ——, traiga; traigamos, ——, traigan.
SUB. *Present.* Traiga, traigas, traiga; traigamos, traigáis, traigan.—*Imperfect.* Trajera *or* trajese, trajeras *or* trajeses, trajera *or* trajese; trajéramos *or* trajésemos, trajérais *or* trajeseis, trajeran *or* trajesen.—*First Future.* Trajere, trajeres, trajere; trajéremos, trajéreis, trajeren.

19. The irregular verb *valer*, to be worth, is thus conjugated:—

INF. *Past Participle.* Valido.—*Gerund.* Valiendo.
IND. *Present.* Valgo (*no other Persons irregular*).—*First Future.* Valdré, valdrás, valdra; valdremos, valdreis, valdrán.
IMP. Valga, ——, valga; valgamos, ——, valgan.
SUB. *Present.* Valga, valgas, valgá; valgamos, valgáis, valgan.—*Imperfect.* Valdría, valdrias, valdría; valdríamos, valdríais, valdrían.

20. The irregular verb *ver*, to see, is thus conjugated:—

Inf. *Past Participle.* Visto.—*Gerund.* Viendo.

Ind. *Present.* Veo (*no other Persons irregular*).—*Imperfect.* Veía *or* vía, veías *or* vías, veía *or* vía; veíamos *or* víamos, veíais *or* víais, veían *or* vían.

Imp. Vea, ——, vea; veamos, ——, vean.

Sub. *Present.* Vea, veas, vea; veamos, veáis, vean.

IRREGULAR VERBS OF THE THIRD CONJUGATION.

21. The irregular verb *adquirir*, to acquire, is thus conjugated:—

Inf. *Past Participle.* Adquirido.—*Gerund.* Adquiriendo.

Ind. *Present.* Adquiero, adquieres, adquiere; ——, ——, adquieren.

Imp. Adquiera, adquiere, adquiera; ——, ——, adquieran.

Sub. *Present.* Adquiera, adquieras, adquiera; ——, ——, adquieran.

22. The irregular verb *asir*, to seize, is thus conjugated:—

Inf. *Past Participle.* Asido.—*Gerund.* Asiendo.

Ind. *Present.* Asgo (*no other Persons irregular*).

Imp. Asga, ——, asga; asgamos, ——, asgan.

Sub. *Present.* Asga, asgas, asga; asgamos, asgáis, asgan.

The verb is but little used in those persons of tenses that are irregular.

23. The irregular verb *bendecir*, to bless, is thus conjugated:—

Inf. *Past Participle.* Bendecido.—*Gerund.* Bendeciendo.

Ind. *Present.* Bendigo, bendices, bendice; ——, ——, bendicen.—*Perfect Definite.* Bendije, bendijiste, bendijo; bendijimos, bendijísteis, bendijeron.

Imp. Bendiga, bendice, bendiga; bendigamos, ——, bendigan.

Sub. *Present* Bendiga, bendigas, bendiga; bendigamos, bendigais, bendigan.—*Imperfect.* Bendijera *or* bendijese, bendijeras *or* bendijeses, bendijera *or* bendijese; bendijéramos *or* bendijésemos, bendijerais *or* bendijéseis, bendijeran *or* bendijesen.—*First Future.* Bendijere, bendijeres, bendijere; bendijéremos, bendijérais, bendijeren.

Maldecir, to curse, is irregular in the same persons and tenses as *bendecir*.

24. The irregular verb *decir*, to say, is thus conjugated:—

Inf. *Past Participle.* Dicho.—*Gerund.* Diciendo.

Ind. *Present.* Digo, dices, dice; ——, ——, dicen.—*Perfect Definite.* Dije, dijiste, dijo; dijimos, dijísteis, dijeron.—*First Future.* Diré, dirás, dirá; diremos, diréis, dirán.

Imp. Diga, di, diga; digamos, ——, digan.

Sub. *Present.* Diga, digas, diga; digamos, digáis, digan.—*Imperfect.* Dijera, diría, *or* dijese; dijeras, dirías, *or* dijeses; dijera, diría, *or* dijese. Dijéramos, diríamos, *or* dijésemos; dijérais, diríais, *or* dijéseis; dijeran, dirían, *or* dijesen.—*First Future.* Dijere, dijeres, dijere; dijéremos, dijéreis, dijeren.

Contradecir, *desdecir*, and *predecir* end their second person singular of the imperative in *-ice*; as, *contradice*, *desdice*, *predice*. In other respects they are conjugated like *decir*.

25. The irregular verb *dormir*, to sleep, is thus conjugated:—

Inf. *Past Participle.* Dormido.—*Gerund.* Durmiendo.

Ind. *Present.* Duermo, duermes, duerme; ——, ——, duermen.—*Perfect Definite.* ——, ——, durmio; ——, ——, durmiéron.

Imp. Duerma, duerme, duerma; durmamos, ——, duerman.

Sub. *Present.* Duerma, duermas, duerma; durmamos, durmáis, duerman.—*Imperfect.* Durmiera *or* durmiese, durmieras *or* durmieses, durmiera *or* durmiese; durmiéramos *or* durmiesemos, durmiérais *or* durmiéseis, durmieran *or* durmiesen.—*First Future.* Durmiere, durmieres, durmiere; durmiéremos, durmiéreis, durmieren.

26. The irregular verb *erguir*, to stand erect, is thus conjugated:—

Inf. *Past Participle.* Erguido.—*Gerund.* Irguiendo.

Ind. *Present.* Hiergo *or* yergo, hirgues, hiergue; ——, ——, hierguen.—*Perfect Definite.* ——, ——, irguió; ——, ——, irguieron.

Imp. Hierga *or* yerga, hiergue, hierga; irgamos, ——, hiergan

Sub. *Present.* Hierga *or* yerga, hiergas, hierga; irgamos irgais, hiergan.—*Imperfect.* Irguiera *or* irguiese, irguieras *or* irguieses, irguiera *or* irguiese; irguiéramos *or* irguiésemos, irguierais *or* irguieseis, irguieran *or* irguiesen.—*First Future.* Irguiere, irguieres, irguiere; irguiéremos, irguiéreis, irguieren.

27. The irregular verb *incluir*, to include, is thus conjugated:—

Inf. *Past Participle.* Incluido.—*Gerund.* Incluyendo.

Ind. *Present.* Incluyo, incluyes, incluye; ——, ——, incluyen.

Imp. Incluya, incluye, incluya; incluyamos, ——, incluyan.

Sub. *Present.* Incluya, incluyas, incluya; incluyamos, incluyais, incluyan.—*Imperfect.* Incluyera *or* incluyese; incluyeras *or* incluyeses, incluyera *or* incluyese; incluyéramos *or* incluyesemos, incluyérais *or* incluyéseis, incluyeran *or* incluyesen.—*First Future.* Incluyere, incluyeres, incluyere; incluyeremos, incluyéreis, incluyeren.

28. The irregular verb *ir*, to go, is thus conjugated:—

Inf. *Past Participle.* Ido.—*Gerund.* Yendo.

Ind. *Present.* Voy, vas, va; vamos, váis, van.—*Imperfect.* Iba, ibas, iba; íbamos, íbais, iban.—*Perfect Definite.* Fuí, fuiste, fué; fuimos, fuísteis, fueron.

Imp. Vaya, ve, vaya; vamos*, id, vayan.

Sub. *Present.* Vaya, vayas, vaya; váyamos, vayáis, vayan.—*Imperfect.* Fuera *or* fuese, fueras *or* fueses, fuera *or* fuese; fuéramos *or* fuésemos, fuérais *or* fuéseis, fueran *or* fuesen.—*First Future.* Fuere, fueres, fuere; fuéremos, fuéreis, fueren.

29. The irregular verb *lucir*, to shine, is thus conjugated:—

Inf. *Past Participle.* Lucido.—*Gerund.* Luciendo.

Ind. *Present.* Luzco (*no other Persons irregular*).

Imp. Luzca, ——, luzca; luzcamos, ——, luzcan.

Sub. *Present.* Luzca, luzcas, luzca; luzcamos, luzcáis, luzcan.

30. The irregular verb *oir*, to hear, is thus conjugated:—

Inf. *Past Participle.* Oido.—*Gerund.* Oyendo.

Ind. *Present.* Oigo, oyes, oye; ——, ——, oyen.

Imp. Oiga, oye, oiga; oigamos, ——, oigan.

Sub. *Present.* Oiga, oigas, oiga; oigamos, oigais, oigan.—*Imperfect.* Oyera *or* oyese, oyeras *or* oyeses, oyera *or* oyese; oyéramos *or* oyésemos, oyérais *or* oyéseis, oyeran *or* oyesen.—*First Future.* Oyere, oyeres, oyere; oyéremos, oyéreis, oyeren.

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* Sometimes *vayamos*, though this form is now seldom used.

31. The irregular verb *producir*, to produce, is thus conjugated:—

Inf. *Past Participle.* Producido.—*Gerund.* Produciendo.

Ind. *Present.* Produzco (*no other Persons irregular*).—*Perfect Definite.* Produje, produjiste, produjo; produjimos, produjisteis, produjeron.

Imp. Produzca, ——, produzca; produzcamos, ——, produzcan.

Sub. *Present.* Produzca, produzcas, produzca; produzcamos, produzcáis, produzcan.—*Imperfect.* Produjera *or* produjese, produjeras *or* produjeses, produjera *or* produjese; produjéramos *or* produjésemos, produjérais *or* produjéseis, produjeran *or* produjesen.—*First Future.* Produjere, produjeres, produjere; produjéremos, produjéreis, produjeren.

32. The irregular verb *salir*, to go out, is thus conjugated:—

Inf. *Past Participle.* Salido.—*Gerund.* Saliendo.

Ind. *Present.* Salgo (*no other Persons irregular*).—*First Future.* Saldré, saldrás, saldrá; saldremos, saldréis, saldrán.

Imp. Salga, sal, salga; salgamos, ——, salgan.

Sub. *Present.* Salga, salgas, salga; salgamos, salgais, salgan.—*Imperfect.* Saldría, saldrías, saldría; saldríamos, saldríais, saldrían.

33. The irregular verb *sentir*, to feel, is thus conjugated:—

Inf. *Past Participle.* Sentido.—*Gerund.* Sintiendo.

Ind. *Present.* Siento, sientes, siente; ——, ——, sienten.—*Perfect Definite.* ——, ——, sintió; ——, ——, sintieron.

Imp. Sienta, siente, sienta; sintamos, ——, sientan.

Sub. *Present.* Sienta, sientas, sienta; sintamos, sintáis, sientan—*Imperfect.* Sintiera *or* sintiese, sintieras *or* sintieses, sintiera *or* sintiese; sintéramos *or* sintiésemos, sintiérais *or* sintiéseis, sintieran *or* sintiesen.—*First Future.* Sintiere, sintieres, sintiere; sintiéremos, sintiéreis, sintieren.

34. The irregular verb *servir*, to serve, is thus conjugated:—

Inf. *Past Participle.* Servido.—*Gerund.* Sirviendo.

Ind. *Present.* Sirvo, sirves, sirve; ——, ——, sirven.—*Perfect Definite.* ——, ——, sirvió; ——, ——, sirvieron.

Imp. Sirva, sirve, sirva; sirvamos, ——, sirvan.

Sub. *Present.* Sirva, sirvas, sirva; sirvamos, sirváis, sirvan.—*Imperfect.* Sirviera *or* sirviese, sirvieras *or* sirvieses, sirviera *or* sirviese; sirviéramos *or* sirviésemos, sirviérais *or* sirviéseis, sirvieran *or* sirviesen.—*First Future.* Sirviere, sirvieres, sirviere; serviéremos, serviéreis, sirvieren.

35. The irregular verb *venir*, to come, is thus conjugated:—

Inf. *Past Participle.* Venido.—*Gerund.* Viniendo.

Ind. *Present.* Vengo, vienes, viene; ——, ——, vienen.—*Perfect Definite.* Vine, viniste, vino; vinimos, vinísteis, vinieron.—*First Future.* Vendré, vendrás, vendrá; vendremos, vendréis, vendrán.

Imp. Venga, ven, venga; vengamos, ——, vengan.

Sub. *Present.* Venga, vengas, venga; vengamos, vengáis, vengan.—*Imperfect.* Viniera, vendría, *or* viniese; vinieras, vendrias, *or* vinieses; viniera, vendría, *or* viniese. Viniéramos, vendríamos, *or* viniésemos; viniérais, vendriais, *or* viniéseis; vinieran, vendrían, *or* viniesen.—*First Future.* Viniere, vinieres, viniere; viniéremos, viniereis, vinieren.

KEY TO EXERCISES.

Ex. 30.—1. God loves us. 2. The painters love her. 3. The German loves truth. 4. They remain contented. 5. You seek repose. 6. Thou remainest sad. 7. Ye speak English. 8. The Frenchman does not eat bread. 9. My brothers do not drink wine. 10. You eat nothing. 11. Ye drink nothing. 12. Mary writes letters. 13. Ye write many letters. 14. You live in the city. 15. How do you like (*find*) this bread? 16. Mary was weeping. 17. Peter was speaking. 18. The women were weeping. 19. I was drinking wine. 20. James was drinking water. 21. I was writing a letter. 22. Thou wast living in Madrid. 23. I was seeking repose. 24. He travelled through Spain. 25. I travelled through the United States. 26. John wept. 27. I read these books. 28. We drank wine and milk. 29. I wrote two letters. 30. They wrote twelve letters. 31. They have refused him that favour. 32. John has refused me that favour. 33. Hast thou travelled through Spain? 34. Have you not eaten bread? 35. I have eaten much bread. 36. Has the judge arrived? 37. Have you found my lamps? 38. Have you travelled through the United States? 39. Till then we had not terminated our business. 40. Hadst thou not already lived in London? 41. When I had found the treasure I wrote letters to my friends. 42. When we had spoken, our sisters wept. 43. We shall travel through England. 44. I shall eat this bread. 45. They will eat apples. 46. They will write letters. 47. My man-servant will carry the letters to the post. 48. They will have arrived at three o'clock. 49. Weep with those who weep. 50. Eat this bread. 51. Fulfil your promises. 52. Eat thou with me. 53. Eat thou with Peter. 54. Let the ladies read those books. 55. Read this letter. 56. Speak Spanish. 57. Do not speak of this. 58. Thou mayest not drink wine. 59. Ye may not weep. 60. It is possible that thou mayest find a treasure. 61. It is probable that they may not fulfil their duties. 62. Oh that ye may find repose! 63. If Mary should weep, John would weep. 64. Oh that men would fulfil their duties! 65. It is possible that they may not have found a treasure. 66. Oh that I had not spoken! 67. If John had not spoken, Mary would not have wept. 68. If they shall find a treasure to-morrow, they will write to us. 69. Permit me to read that book. 70. It was necessary to speak to them. 71. They were eating and drinking. 72. Having found a treasure in the road, we carried it in the lawyer's house.

Ex. 31.—1. Yo lloro. 2. Mi madre busca reposo. 3. Ella no halla reposo. 4. Hablan. 5. Hablas. 6. Lloran. 7. ¿Hablan VV. Español? 8. Hablamos Español. 9. No hallo reposo. 10. Bebes vino. 11. Bebo agua. 12. Como pan. 13. Juan lee libros. 14. Leen libros. 15. ¿No respondes nada? 16. Bebemos vino. 17. Bebeis agua. 18. El medico vive en Londres. 19. Mis hijas viven en los Estados Unidos. 20. Cumples tu palabra. 21. Cumplo mis deberes. 22. Llevábamos mucho dinero. 23. Las señoras buscaban reposo. 24. Yo lloraba. 25. Comíamos pan. 26. Vivían en Londres. 27. Viviais en la ciudad. 28. Escribiamos cartas. 29. La Francesa no halló reposo. 30. Viajamos por Inglaterra. 31. Hallaron un tesoro en el camino. 32. Comió pan y manteca. 33. Comieron azucar. 34. Juan no respondió nada. 35. V. vivió en Madrid. 36. He hallado mis tesoros. 37. ¿Ha llegado el correo? 38. Hemos hallado las cucharas. 39. ¿Le habéis rehusado ese favor? 40. He cumplido mi palabra. 41. Han cumplido su palabra. 42. ¿Has comido mucho miel? 43. Hasta entonces habíais hablado Español. 44. Ya habian comido cuando llegamos. 45. Hasta entonces habian vivido en paz. 46. Cuando hubiste comido; tu padre llego. 47. Viajaré por España. 48. Hallará un tesoro. 49. Leerás esos libros. 50. Cumpliremos nuestras palabras. 51. Habré comido á las dos. 52. El corréo habia llegado á las dos. 53. Bebed água. 54. Vivid en paz con todos los hombres. 55. Lea Maria mis cartas. 56. Cumplan los hombres sus deberes. 57. Coma V. manzanas y peras. 58. Lean VV. esa carta. 59. No léa V. ese libro. 60. Respondedme. 61. Escribidles. 62. Escribanos. 63. Es posible que lean esos libros. 64. Probable es que ella no le responda. 65. Si yo hallase libros, yo los leeria. 66. ¡ Ojala ! no bebiesen vino ! 67. ¡ Ojala no llorase ! 68. Preciso era que Maria no hablase alto. 69. Es posible que no haya llegado. 70. Era estraño que no hubiesen hallado esos libros. 71. Si mañana llegare Pedro, te escribiré. 72. ¿ Me permitirá V. leer esa carta? 73. Juan pretende no haber hablado. 74. Habiendo hallado un libro le lei.

Ex. 32.—1. How do you find yourself? 2. The lawyers conduct themselves badly. 3. Ye behave yourselves badly. 4. The carpenter finds himself contented. 5. Peter praises himself. 6. The general armed himself. 7. They saved themselves. 8. I hid myself. 9. We hid ourselves. 10. Oh that I might find myself with her ! 11. Thy friends will assemble themselves in London. 12. Praise ye yourselves. 13. Let us arm ourselves. 14. Arm yourself. 15. I rejoice much. 16. The winter draws near. 17. You jest. 18. Peter complains. 19. Of whom do they complain? 20. I always rise at six o'clock. 21. Would you not retire from the country? 22. They rejoice. 23. Rejoice ye. 24. Let them rejoice. 25. Do not complain. 26. Let us not meddle in the affairs of the judge.

Ex. 33.—1. Pedro se porta bien. 2. Te portas bien 3. Ellas se juntaron en Madrid. 4. Te amas. 5. La muger se escondió. 6. Se alaban mis hermanos. 7. Me alabó. 8. Nos amamos. 9. Se han portado mal. 10. ¡ Ojala se portasen bien ! 11. Escondete. 12. Salvaos. 13. Alabese V. 14 Te burlas. 15. Se acerca la primavera. 16. Se quejan. 17. Te alegras. 18. Se ha levantado. 19. ¿ Me he metido nunca en sus asuntos? 20. Me retirare.

COMPARATIVE ANATOMY.—XI.

[*Continued from Vol. VII., p. 378.*]

ECHINODERMATA (*continued*).

It will be seen that almost all the parts of the echinus are radially disposed, yet the individuals are separate and locomotive. We have, therefore, the radial structure, which is best suited to a fixed condition, and a vegetative habit, united with habits such as characterise the higher animals, for the echinus does nor float or move hap-hazard, as the free-swimming hydrozoon does, but evidently searches for food, and has a definite object in locomotion. We might, therefore, expect that in this class we should find different grades, leading from a fixed condition, with its radial symmetry, up to the more perfect method of locomotion which accompanies an elongated form and a two-sided arrangement.

We might expect that a radiated animal was a fixed flower-like animal fallen from off its stalk. This we found to be the case with the Medusæ, and we could trace the transformation in the life-history of the animal. In the class Echinodermata, we may also find it is so, only we have to look not simply to the life-history of one animal, but to trace up the development of the different groups throughout the class. The stone-lilies are such flower-like, almost fixed animals: they were very numerous in geologic times, and the hard joints of their long stalks afforded no small puzzle to geologists. The problem was solved by the discovery both of the whole fossil hard parts of the animal united, and also of some existing representatives of the order in tropical regions. The Crinoids, as they are called, grow like plants in the seas of the tropics. A stem of gelatinous matter encloses the closely applied hard joints, and bears on its summit a cup, walled in by more hard pieces, around whose edges long arms are developed. Their shape is too complicated for description here, but it suffices to say that the cup corresponds to the box of the echinus. An animal found in our own seas commences life like a stone-lily, and absolutely falls off its stem at a certain stage to commence a new locomotive life; it is known as the rosy feather-star (*Antedon*).

The star-fish represents another type, and although its general form is so different from that of the echinus, it is not difficult to show how the one is allied to the other. If we suppose the echinus to be quartered, as we quarter an orange, by dividing it along the zigzag lines between the larger plates, and then each division opened, bent down, and flattened out, while the intermediate membrane is supposed to be indefinitely elastic, so as to stretch and cover in the upper part of the animal we should have a star-fish. All the ambulacra would be on the under side of the animal. The so-called eyes would be at the end of the rays, the madreporic plate being the only element left near its original position. This arrangement is exactly that found in the starfish, or asterias.

The asterias, however, present many points of dissimilarity from the echinus, especially in relation to the alimentary canal. Canal it is not in the proper sense, for some have only one opening, through which the food is both received and ejected. Ten organs—two lying in each ray—empty themselves into the sides of the stomach. The most singular thing is that the starfish, although so nearly allied to the echinus, presents not a trace of the singularly complicated apparatus of jaws and teeth which we have described as found in the latter animal. Near the echini come the sea-cucumbers, which resemble the echini in having avenues of tubular feet to walk with, but differ from them in having soft elongated muscular integuments, by the contractions of which they move. Sometimes the avenues of suckers in these animals are all brought together to one side, on which the creature crawls. We have thus an approach to the two-sided arrangement found in the snail. These animals have a curious system for effecting the function of respiration. This is not done by exposing the juices of the body to the influence of the oxygen of the water by protrusions of their membranes externally, but the water is forced into two organs which run up into the body, and which are so branched as to be called the respiratory trees. The water is forced into the branches of these trees by means of a muscular bulb at the end of the alimentary canal, into which the sea-water is received from behind by a wide opening, and then injected into the organs. This arrangement is the aquatic representative of the tracheal system in insects.

We have no space left to dwell upon the nervous system of these animals, or on the curious development of many of them from larval forms quite unlike in shape from the mature animals, and which forms, contrary to what we might have expected, present a perfect two-sided symmetry.

The orders into which the class is divided, and which we have cursorily described, are thus named:—

1. Crinoidea = stone-lilies.
2. Ophiuroidea = brittle-stars.
3 Asterioidea = star-fish.
4. Echinoidea = sea-urchins.
5. Holothurioidea = sea-cucumbers.

MOLLUSCA.

LAMELLIBRANCHIATA.

We must pass over a number of interesting groups of animals to devote what remains of our space to the two large and important groups of animals which are known as the Mollusca and the Vertebrata. Of the former, the simplest secrete a hard chalky substance in the form of two hollow saucer-shaped pieces, that fit more or less closely together along their edges, and which, therefore, when drawn together, can completely protect the animal, that lies wholly between them, from all injury. These are called *Bivalve Molluscs*. The shells are so united at one point in their circumferences as to play upon that point as a hinge, while the remainder of the two shells can be separated so as to gape more or less widely on the side opposite the hinge. In this manner the creatures can keep open house when their guests are likely to be those upon which they can prey, and can shut their folding doors when they are themselves likely to be victimised. These shells are usually thick and heavy, especially in those species which are marine, for the wear and tear of the sea is greater, and the predatory creatures more powerful than those in fresh water. Moreover, the box or house must be tolerably capacious, otherwise the creatures could not breathe while they were in a state of siege, and must surrender at discretion to the expectant lobster or other freebooter of the deep. It follows that this arrangement is not well suited to locomotion; and not being locomotive to any great degree, they are not endowed with those perfect organs of sense that must be possessed by those animals which chase their prey. When organs of sense are possessed, they are usually collected on a protruded part of the body, and placed above the mouth, which opens at the front part. Such a projection, which supports the eyes, feelers, ears, and smelling capsules, and contains a nervous centre conveniently and closely situated to these gateways of knowledge, is usually called a head. Now these bivalve molluscs are distinguished from the higher orders in having no heads, and are called acephalous. They have mouths, and a nerve-knot above this; but the mouth is not prominent, and lies far within the shelly box, and often between soft projections of the body, which extend some distance beyond it. Their organs of sense are also very poor and imperfect; and when they are possessed at all, they are placed in other parts of the body. In the Lamellibranchiata, as these animals are called, the double shell is usually flattened as though the creatures had been squeezed by pressure applied to its sides, and this flattening is called, in the language of Comparative Anatomy, *compression*. Now, as these passive creatures, whether fixed or free, usually rest on the floor of the sea, it follows that they must lie, not on the edges, but on the flats of their shells; and when thus lying, they rest habitually on one shell, and this shell is often so modified in relation to the other as to suit the lying posture. A similar instance of this effect of habit on the two-sided arrangement of the body is seen in the soles, turbot, etc., which constitute the family of fishes called Pleuronectidæ, as contrasted with the equally flat rays. The depressed rays, lying with their backs uppermost, are quite symmetrical; while the soles, resting on their sides, are quite distorted in shape, and the two sides differ in colour. Notwithstanding this tendency to one-sidedness in the Lamellibranchiata, due to habit, most of them have nearly equal valves; and in none is the internal arrangement of organs much interfered with.

The Lamellibranchiata are mainly characterised by their breathing organs. They have no fringed arms stretching away from the sides of the mouth; and their mantle not being sufficiently effective as an organ of respiration, they have—developed from the body, and lying between the mantle-lined shells and the body mass—two sheets of membrane on each side. The relation of these breathing plates is best seen in the illustration (Fig. 33, IV.), where there is a section given of the animal as it would appear if it were cut across so as to divide both shells. These gill-plates secure that the blood shall be well aërated, not only by exposing as large an amount of surface as possible, but also by having gill-tubes, which run through the plates from one edge to the other, through which the water passes. As is usually the case with breathing surfaces in marine animals, the plates are covered with cilia, whose motion secures a constant change in the water. The gill-plates are very variously modified in the different families of Lamellibranchiata; but they are constant throughout the class.

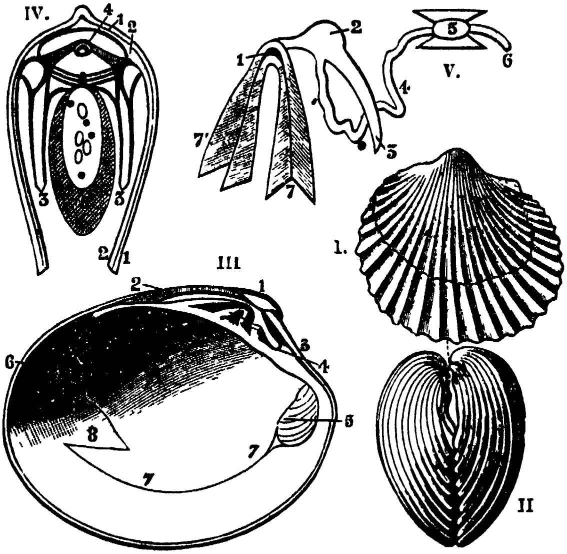

Fig. 33 —Lamellibranchiata.—I Cardium. II. Ditto, side view. III. Cytherea. IV Diagrammatic transverse section of a Lamellibranch. V. Isolated alimentary canal of a Solen.

Refs. to Nos in Figs.—III. 1, umbo or elbow; 2, external ligament; 3, cardinal teeth of the hinge; 4, lateral ditto; 5, anterior adductor; 6, posterior ditto; 7, mantle lining; 8, the sinus IV 1, shell; 2, mantle; 3, gills; 4, heart folded over the intestine; 5, foot inclosing folds of the intestine and vessels. V. 1, mouth; 2, stomach; 3, blind sac containing the endostyle; 4, intestine; 5, heart; 6, anus; 7, 7', membranous lips.

In some, as the oyster, the mantle simply lines the shells and ends at their edges, so that the water has free entrance from all sides. In other families the mantle of one side passes across the aperture of the shell to be united at certain points, or along almost its whole length, to the mantle of the opposite shell. In others the animal is not only almost entirely walled in by the union of the two lobes of the mantle, but part of this mantle is drawn out into two long tubes, one of which communicates with the chamber in which the gills lie, and the other with the smaller chamber into which the anus opens, and into which also the gill-tubes discharge the water. This last arrangement is carried to an extreme in those species which burrow and live in holes of the rock or mud at the sea-bottom. The only communication which these have with the outer world is by means of their extended tubes or *siphons*, as they are called. In their case the two tubes are united into one sheath, although a partition passing down the double tube always keeps them functionally distinct. In these creatures the action of the cilia drives the water in one continuous stream from the gill chamber to the atrial chamber through the tubes; and this motion necessitates a flow down one tube and up another. By this means floating food is passed along the gills to the mouth, which is situated at the lower end of the buried molluscs.

The mantle is partly employed in secreting the shell. It performs this office in a very efficient manner, so as always to allow for the growth of the animal and for the strengthening of the shell as the contained animal becomes more weighty, and therefore liable to experience more violent collisions. The method of secretion is the following:—Round the edge of the mantle lobes, or at that part where they leave the shells, are situated a great number of glands, whence secretions of different substances are poured out and mingled together. These glands secrete horny matter, a large quantity of carbonate of lime, and some pigment. Thus a fresh rim of hard matter is added at intervals to the shell. The size, shape, markings, and colours of the shell are all determined by the edges of this mantle; and the whole of these characters differ so greatly in the different species, and the result is so beautiful in many, that a collection of shells is very interesting. The nucleus, or starting-point from which the formation of the shell proceeds, is called the umbo; and the manner in which the additions are made is very various. Sometimes the mantle edge secretes a great deal of matter at one time of the year, and is nearly inactive, or only pours out a thin secretion, at another; and this will produce a shell with ridges and furrows parallel to the edges of the shell. If the mantle secretes at certain points in larger quantity, and but little between these points, or if it be folded or puckered, and the folds remain so during the whole of the growth, then ridges and channels are formed, stretching continuously from umbo to margin. If the margin of the mantle is much folded and thrust out during secretion, it sometimes results in long points or projections, which reach far beyond the rest of the outside of the shell. In the same way it will be seen that the lining and colouring of the shell into patterns may be effected by the partial and intermittent secretion of colouring matter. The shell, while it is being extended, is also thickened by a thin secretion poured out all over the external surface of the mantle, and therefore all over the internal surface of the shell. This latter secretion is always smooth and colourless, or with only a faint unvariegated pink or purple tint. It is, however, sometimes of a pearly lustre; but the rainbow-like tints of pearl are not caused by the absorption of the other kinds of light, as is the case with coloured surfaces, but from the way in which it is reflected from a very fine ridge-and-furrow surface, the undulations of which are too small and too close to be seen by the naked eye. The nacre, or lining of the shell, feels perfectly smooth, and contrasts with the rough outside of the shell. The polished internal surface is no doubt constructed as much with reference to the comfort of the animal as the rough and spined outside is to its defence. Indeed, the smooth secretion in some species will soon encrust any foreign body introduced between the mantle and the shell, and hence the origin of pearls, which usually have as their nucleus a grain of sand.

The two valves of the shell are united by the mantle, and at or near the umbo of each valve there is a hinge surface upon which the valves open. This hinge has often a complex system of teeth, which, while they allow the valves to gape. will not permit them to be shifted or wrenched aside on one another. Very powerful muscles run directly from shell to shell, and can, when contracted, hold them together with such force that it is impossible to open them without the assistance of an oyster-knife; and as none of the natural enemies of the molluscs, except man, possess oyster-knives, they are tolerably safe from this kind of forcible entry upon their fortresses. In most lamellibranchs there are two muscles to close the valves, one in front and the other behind; but in the oyster family there is but one, and this is near the centre of the shell, and represents the hind muscle of the others. Opposed to these muscles is the ligament which runs from shell to shell on the outside of some species, and lies in a pit in the hinge surface in others. These ligaments have no power of active contraction as the muscles have, but are passively elastic. In the case of the external ligament, it is in a state of strain when the valves are closed, and opens them when the muscles relax; while in the case of the internal ligament, it is compressed when the muscles are contracted, and presses the valves apart when they relent.

The mouth is without hard teeth or jaws; but it often has large flattened lips. The throat is short, and leads into a roundish stomach; the great peculiarity of this is the long blind sac which is attached to it, in which is enclosed a cartilaginous rod, the function of which is not known. The intestine twists about in several folds, entering the foot in those bivalves which have a foot, and always ending at the opposite side to the mouth and in the atrial chamber. The foot is an organ of very various development and very various functions in the different species. In some its main office seems to be the secretion of threads by which the creatures moor themselves to rocks. These threads are formed in a groove in the foot, and one end of the thread, while yet viscid, sticky, and unconsolidated, is applied by the foot to the rock. To this it adheres; and when the foot is pulled back, the thread is pulled out of its groove and a fresh one made, so that at length a bundle of very strong threads passes from the support to the base of the foot. In other cases, as in the solen, the foot is large and broad, and passes out in front of the long razor-like shell by a slit in the mantle, and with this foot the creature burrows in the sand. In the cockle the foot is long, and can be thrust out and applied to the earth so as to jerk the animal along. In other species it is little else than a muscular investment of the viscera.

For a classification of the bivalve Mollusca the reader is referred to Woodward's excellent manual, for the families are so numerous that their characters cannot all be given in this limited article, and a list of names would be little instructive.

GASTROPODA.

The Gastropoda derive their name from the usual form of the locomotive organ, which is so constantly found, though so variously developed, in the different members of this class. We found the foot in the Lamellibranchiata to be an organ which, in some, secreted the byssus or anchor-cable, in others bored holes, and yet in others accomplished jerky movements of the body. In the swan-mussel of our rivers this instrument is applied to more regular and definite locomotion, and with the foot they may be seen ploughing their way through the soft mud which falls to the bottom of the stream. In their case, however, the foot is a rounded organ, and at its end is something like the human tongue, both in shape and structure. In the gastropods, or belly-walkers, the foot is a flat broad surface placed along the under side of the body, by means of which the animal can crawl over solid bodies. In some of the lamellibranchs the shape of the foot is much more like that of the human foot than in any of the gastropods; but in function, of course, the foot of the gastropods is much more like a foot than the same organ in the lower class. Usually the foot is a muscular, elongated sheet, broader and longer than the body of the animal, and acts at the same time as the wall of the body and the means of propelling it along. The whole rim of the foot all the way round is usually thickened, and can be closely applied to a smooth surface, while the central parts can be thrown in wrinkles. Thus the whole acts as a kind of sucker or holdfast, while all the middle parts, being alternately applied to the ground and dragged over it, effect a movement in which the whole animal participates. If the reader allows a slug to crawl up a pane of glass, and looks at it through the transparent medium, he will see successive waves moving all along the foot, showing that, while a series of points are fixed, the parts in between are moving, and the moving parts then become fixed, allowing the previously fixed parts to be pushed or pulled along by the contraction of the muscles embedded in the skin. Such a mode of progression, which may be called piecemeal, is, of course, very slow, but it is sure; and how should an animal without limbs move over a solid surface otherwise? Associated with this power of definite locomotion, slow as it is, the whole organism is modified.

Let us suppose that a lamellibranch had the under part of its foot flattened into a broad muscular sheet, capable, not of pushing through soft mud, but of gliding over smooth rock; how could it make use of its new power of locomotion? It would, in the first place, be hampered with two immense shields, which, being ample enough to close upon its whole body, would certainly have their edges dragged over and ground upon the rock over which it passed, and thus wrenched about in relation to one another and to the soft parts of the animal united to them. Then its large sheets of unprotected membrane, called gills, would be liable to be torn and bruised. Add to these inconveniences the fact that it would be without eyes or feelers in the fore part of the body to direct its course, or to take observations of what occurred, and we may judge that the benefits of travel would be quite outweighed by its dangers and troubles. In the gastropods there is only one shell, and it is drawn out in an upward direction, so that, while the more delicate organs are securely lodged, the edges of the shell's mouth are withdrawn from the ground.

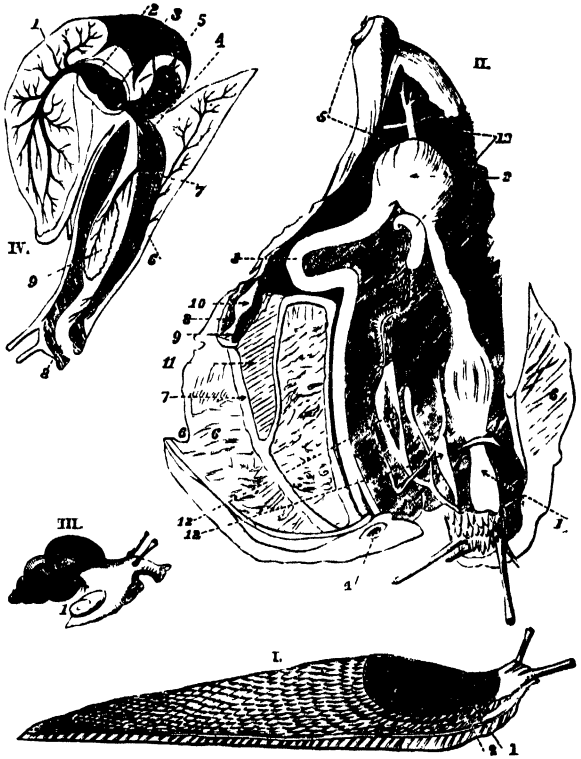

Fig. 34. PULMONATA,—I. ARION (THE BLACK SLUG). II. AGATHINA MAURITANICA. III. CYCLOSTOMA ELEGANS. IV. DIAGRAM OF THE CIRCULATION IN A SNAIL.

Refs. to Nos. in Figs.—I 1, orifice of lung-chamber; 2. anus. II. 1, throat; 2, stomach, 3, intestines; 4, anus; 5, liver; 6, 6, pulmonary diaphragm; 7, main vein; 8 chamber surrounding the heart; 9, auricle (receiver); 10, ventricle (distributor); 11, kidney; 12, generative organs. (N.B. In this diagram the shell has been removed and the skin cut along the back and opened; the floor of the lung also is thrown aside.) III. 1, operculum. IV. 1, lung vein; 2, auricle; 3, ventricle; 4, main artery; 5, liver artery; 6, foot artery; 7, stomach artery; 8, buccal cavity; 9, salivary gland.

The gills are removed out of harm's way in a singular manner. Those on one side (usually the right) are brought right up and placed on the animal's back, and there enclosed by a fold of the leathery skin, being placed partially in the last or largest part of the shell cavity, while those of the other side are entirely aborted or dispensed with.

This arrangement gives a one-sidedness to the animal, and, perhaps, is the determining cause of the shell being made more compact in the method peculiar to gastropods, namely, by being twisted into a one-sided spiral or helix, as it is technically called. The head, with its feelers, eyes, and ears, can be thrust out from the shell and stretched well forward, so as to gain some acquaintance with those external objects which come within the line of march. How the lamellibranch may possibly have been modified into the gastropod is shown by placing side by side some intermediate forms between the more typical turbo and the river-mussel (*Unio*). In patella (the limpet) it will be seen that the gills are still on both sides of the animal, as are also the muscles, though these have no longer the office of closing the shell, which in this case is consolidated into an equilateral cone. In the bonnet limpet one side of the breathing organs has been aborted, while in turbo both the breathing apparatus and muscles of one side are gone, and the whole animal is twisted in its upper part into a one-sided spire. In this case a rounded horny plate is developed on the upper part of the foot, or rather tail of the creature, and this, when the animal pulls back its head and thin foot into the shell, closely closes the aperture. This *operculum*, as it is called, is supposed to be the representative of the horny byssus of the bivalve, being, as will be seen, similarly situated.

ITALIAN.—XIII.

[*Continued from Vol. VII., p. 350.*]

IRREGULAR VERBS OF THE SECOND CONJUGATION (*continued*).

II. IRREGULAR VERBS ENDING IN *-ere* SHORT (*cont.*).

THE irregular verb *opprímere*, to oppress, is thus conjugated :—

INDEF. *Simple Tenses.—Pres.* Opprímere, *to oppress.—Pres. Gerund.* Oppriméndo, *oppressing.—Past Part.* Opprésso, *oppressed.——Compound Tenses.—Past.* Avére opprésso, *to have oppressed.—Past Gerund.* Avéndo opprésso, *having oppressed*

IND. *Pres.* Opprimo, opprimi, opprime ; opprimiámo, opprimete, opprímono.—*Imp.* Oppriméva, opprimévi, oppriméva ; opprimevámo, opprimeváte, opprimévano.—*Ind. Pret.* Opprési, oppriméstí, opprésse ; opprimémmo, oppriméste, opprésero.—*Fut.* Opprimerò, opprimerái, opprimerà ; opprimerémo, opprimeréte, opprimeránno.—*Cond. Pres.* Opprimeréi, opprimerésti, opprimerébbe ; opprimerémmo, opprimeréste, opprimerébbero.

IMP. Opprími, opprima ; opprimiámo, oppriméte, opprímano.

SUB. *Pres.* Che opprima, che opprima, che opprima ; che opprimiámo, che opprimiáte, che opprímano.—*Imp.* Che oppriméssi, che oppriméssi, che opprimésse ; che oppriméssimo, che oppriméste, che opprimésero.

After this example conjugate the following :—

Indef. Pres.	*Ind. Pres.*	*Ind. Pret.*	*Past Part.*	*English.*
Comprímere,	comprímo,	comprési,	comprésso,	*to keep under.*
Esprímere,	esprímo,	esprési,	esprésso,	*to express.*
Imprímere,	imprímo,	imprési,	imprésso,	*to impress.*
Reprímere,	reprímo,	représi,	représso,	*to restrain.*
Assúmere,	assúmo,	assúnsi, assuméstí, assúnse, assumémmo, assuméste, assúnsero,	assúnto,	*to take up.*
Consúmere,	consumo,	consúnsi,	consúnto,	*to consume.*
Presumere,	presúmo,	presúnsi,	presúnto,	*to presume.*
Redímere,	redímo,	redénsi, rediméstí, redénse, redimémmo, rediméste, redénsero,	redénto,	*to redeem.*

The irregular verb *pórre,* to put, is thus conjugated :—

INDEF. *Simple Tenses.—Pres.* Pórre, *to put.—Pres. Gerund.* Ponendo, *putting.—Past Part.* Pósto, *put.——Compound Tenses.—Past.* Avére pósto, *to have put.—Past Gerund.* Avendo pósto, *having put.*

IND. *Pres.* Póngo, póni, póne ; poniámo, ponéte, póngono.—*Imp.* Poneva *or* ponéa ; ponévi ; ponéva, ponéa, *or* ponía. Ponevamo ; ponevate ; ponevano *or* ponéano.—*Ind. Pret.* Posi, ponesti, póse ; ponémmo, ponéste, pósero.—*Fut.* Porrò, porrái, porrà ; porrémo, porréte, porránno.—*Cond. Pres.* Porréi *or* porría, porrésti, porrébbe *or* porría ; porrémmo, porréste, porrébbero.

IMP. Poni, pónga ; poniámo, ponéte, póngano.

SUB. *Pres.* Che ponga *or* pógna, che pónga *or* pógni, che ponga *or* pógna ; che poniámo, che poniáte, che póngano.—*Imp.* Che ponéssi, che ponéssi, che ponésse ; che ponéssimo, che poneste, che ponéssero.

After this example conjugate the following :—

Compórre, *to compose.*
Disporre, *to dispose.*
Riporre, *to replace.*
Frappórre, *to interpose.*
Oppórre, *to oppose.*
Pospórre, *to delay.*

The irregular verb *trárre,* to draw, is thus conjugated :—

INDEF. *Simple Tenses.—Pres.* Trárre, *to draw.—Pres. Gerund.* Traendo, *drawing.—Past Part.* Trátto, *drawn.——Compound Tenses.—Past.* Avere tratto, *to have drawn.—Past* Avendo tratto, *having drawn.*

IND. *Pres.* Trággo, trái *or* trággi, tráe *or* trágge ; traggiámo, traéte, trággono *or* tránno.—*Imp.* Traéva *or* traéa ; traévi ; traéva *or* traéa. Traevámo ; traeváte ; traévano, traéno, *or* traéano.—*Ind. Pret.* Trássi, traésti, trásse ; traémmo, traéste, trássero.—*Fut.* Trarrò, trarrái, trarrà ; trarrémo, trarréte, trarránno.—*Cond. Pres.* Trarréi *or* trarría, trarrésti, trarrébbe *or* trarría ; trarrémmo, trarréste, trarrébbero.

IMP. Trái, trágga ; traiámo *or* traggiámo, traéte, trággano.

SUB. *Pres.* Che trágga, che trágga, che trágga ; che traiámo *or* traggiámo, che traiáte *or* traggiáte, che trággano.—*Imp.* Che traéssi, che traéssi, che traésse ; che traéssimo, che traéste, che traéssero.

After this example conjugate the following :—

Attrárre, *to attract.*
Contrárre, *to contract.*
Distrárre, *to take off.*
Ritrárre, *to draw out.*
Sottrárre, *to subtract.*

The irregular verb *scrivere*, to write, is thus conjugated :—

INDEF. *Simple Tenses.—Pres.* Scrívere, *to write.—Pres. Gerund.* Scrivéndo, *writing.—Past Part.* Scritto, *written.——Compound*

Tenses.—Past. Avère scritto, *to have written.—Past Gerund.* Avéndo scritto, *having written.*

Ind. *Pres.* Scrivo, scrívi, scrive; scriviámo, scrivéte, scrívono. —*Imp.* Scrivéva *or* scrivéa, scrivévi, scrivéva *or* scrivea; scrivevámo, scrivevàte, scrivévano.—*Ind. Pret.* Scríssi, scrivésti, scrisse; scrivémmo, scrivéste, scríssero.—*Fut.* Scriverò, scriverái, scriverà; scriverémo, scriveréte, scriveránno.—*Cond. Pres.* Scriveréi, scriverésti, scriverébbe; scriverémmo, scriveréste, scriverébbero.

Imp. Scrívi, scríva; scriviámo, scrivéte, scrívano.

Sub. *Pres.* Che scríva, che scríva, che scríva; che scriviámo, che scriviáte, che scrívano.—*Imp.* Che scrivéssi, che scrivéssi, che scrivésse; che scrivéssimo, che scrivéste, che scrivessero.

After this example conjugate the following:—

Circonscrivere, *to circumscribe.*
Contrascrívere, *to write against.*
Descrívere, *to describe.*
Inscrívere, *to inscribe.*
Prescrívere, *to prescribe.*
Proscrivere, *to proscribe.*
Riscrívere, *to write again.*
Soscrivere, } *to subscribe.*
Sottoscrivere, }
Soprascrivere, *to put the direction.*
Trascrívere, *to transcribe.*

The irregular verb *vivere*, to live, is thus conjugated:—

Indef. *Simple Tenses.—Pres.* Vívere, *to live.—Pres. Gerund.* Vivéndo, *living.—Past Part.* Vissuto, *lived.——Compound Tenses.—Past.* Avére vissuto, *to have lived.—Past Gerund.* Avéndo vissúto, *having lived.*

Ind. *Pres.* Vivo, vívi, vive; viviámo, vivete, vívono.—*Imp.* Vivéva *or* vivea, vivévi, vivéva *or* vivéa; vivevámo, vivevàte, vivévano *or* vivéano.—*Ind. Pret.* Víssi, vivésti, visse; vivémmo, vivéste, víssero.—*Fut.* Viverò *or* vivrò, viverai, viverà; viverémo, viveréte, viveranno.—*Cond. Pres.* Viverei, vivréi, *or* viveria; viveresti; viverébbe *or* viveria. Viverémmo, viveréste, viverébbero.

Imp. Vívi, víva; viviámo, vivéte, vivano.

Sub. *Pres.* Che víva, che viva *or* vivi, che viva; che viviámo, che viviáte, che vivano.—*Imp.* Che vivéssi, che vivéssi, che vivésse; che vivéssimo, che viveste, che vivéssero.

After this example conjugate the following:—

Convívere, *to live together.*
Benvivere, *to live well.*
Rivívere, *to revive.*
Sorvívere, *to survive.*
Sopravívere, *to survive.*

IRREGULAR VERBS OF THE THIRD CONJUGATION.

The irregular verb *finíre*, to finish, is thus conjugated:—

Indef. *Simple Tenses.—Pres.* Finire, *to finish.—Pres. Gerund.* Finéndo, *finishing.—Past Part.* Finito, *finished.——Compound Tenses.—Past.* Avere finito, *to have finished.—Past Gerund.* Avendo finito, *having finished.*

Ind. *Pres.* Finísco, finisci, finísce; finiámo, finite, finiscono. *Imp.* Finíva, finívi, finíva; finivámo, finiváte, finívano.—*Ind. Pret.* Finii, finisti, finì; finimmo, finiste, finírono.—*Fut.* Finirò, finirái, finirà; finirémo, finirete, finiránno.—*Cond. Pres.* Finiréi, finirésti, finirebbe; finirémmo, finiréste, finirébbero.

Imp. Finisci, finísca; finiámo, finíte, finíscano.

Sub. *Pres.* Che finísca, che finisca, che finisca; che finiámo, che finiáte, che finíscano.—*Imp.* Che finíssi, che finíssi, che finísse; che finíssimo, che finiste, che finissero.

After this example conjugate the following:—

Abbellire, *to embellish.*
Abbonire, *to perfect.*
Bandire, *to banish.*
Brunire, *to burnish.*
Candire, *to candy.*
Chiarire, *to explain.*
Custodire, *to guard.*
Deferire, *to defer.*
Definire, *to define.*
Demolire, *to demolish.*
Erudire, *to teach.*
Esaurire, *to exhaust.*
Garantire, *to warrant.*
Gestire, *to gesticulate.*
Illaidire, *to grow ugly.*
Illiquidire, *to liquefy.*
Istituire, *to institute.*
Istruire, *to instruct.*
Largire, *to give.*
Lenire, *to soften.*
Obbedire, *to obey.*
Olire, *to smell sweet.*
Ostruire, *to obstruct.*
Partorire, *to produce.*
Patire, *to suffer.*
Proibire, *to prohibit.*
Rabbellire, *to adorn.*
Riunire, *to re-unite.*
Sbaldanzire, *to despond.*
Sbalordire, *to astonish.*
Schernire, *to mock.*
Sminuire, *to diminish.*
Supplire, *to supply.*
Tradire, *to betray.*
Vagire, *to cry.*
Ubbidire, *to obey.*
Usucapire, *to claim by possession.*

The defective verb *íre*, to go, is thus conjugated:—

Indef. *Pres.* Íre, *to go.—Past Part.* Íto, *gone.*

Ind. *Pres.* Íte, *you go.—Imp.* Íva, *I was going*: ívano, *they were going.—Fut.* (plur.) Irémo, iréte, iránno.

Imp. Ite, *go ye.*

The irregular verb *uscíre*, to go out, is thus conjugated:—

Indef. *Simple Tenses.—Pres* Uscíre, *to go out.—Pres. Gerund.* Uscéndo, *going out.—Past Part.* Uscíto, *gone out.——Compound Tenses.—Past.* Éssere uscíto, *to have gone out.—Past Gerund.* Esséndo uscíto, *having gone out.*

Ind. *Pres.* Ésco, ésci, esce; usciámo, uscíte, éscono.—*Imp.* Usciva *or* uscía, uscívi, uscíva *or* uscía; uscivámo, usciváte; uscívano, usciano, *or* usciéno.—*Ind. Pret.* Uscii *or* uscì, uscísti, uscì *or* uscío; uscímmo, usciste; uscírono, usciro, *or* uscir.

The irregular verb *veníre*, to come, is thus conjugated:—

Indef. *Simple Tenses—Pres.* Veníre, *to come.—Pres. Gerund.* Venéndo, *coming.—Past Part.* Venúto, *come.——Compound Tenses.—Past.* Éssere venúto, *to have come.—Past Gerund.* Esséndo venúto, *having come.*

Ind. *Pres.* Véngo, viéni, viéne; veniámo, veníte, véngono.—*Imp.* Veníva *or* venía; venívi; veníva *or* venía. Venivámo; veniváte; venívano, venieno, *or* veníano.—*Ind. Pret.* Vénni, venísti, vénne; venimmo, veníste, vénnero *or* veníro.—*Fut.* Verrò, verrái, verrà; verrémo, verréte, verranno.—*Cond. Pres.* Verréi *or* verría, verrésti, verrébbe *or* verría; verrémmo, verréste, verrebbero.

Imp. Viéni, vénga; veniámo, veníte, véngano.

Sub. *Pres.* Che vénga, che vénga, che vénga; che veniámo, che veniate, che véngano.—*Imp.* Che veníssi *or* venéssi, che venissi, che venísse; che venissimo, che veniste, che veníssero.

After this example conjugate the following:—

Avvenire, *to happen.*
Convenire, *to agree.*
Divenire, *to become.*
Invenire, *to find.*
Pervenire, *to attain.*
Rivenire, *to return.*
Sopravvenire, *to come unexpectedly.*
Svenire, *to faint away.*

IMPERSONAL VERBS.

The following are impersonal:—

Baléna, *it lightens.*
Bisógna, *it is necessary.*
Dighiaccia, *it thaws.*
Dilúvia, *it rains very hard.*
Ghiáccia, *it freezes.*
Grándina, *it hails.*
Nevica, *it snows.*
Pióve, *it rains.*
Tuóna, *it thunders.*

Several other verbs become impersonal. They are as follow:—

Appartiéne, *it belongs.*
Avviéne, *it happens.*
Conviéne, *it is convenient.*
Básta, *it suffices.*
Impórta, *it concerns.*
Léce, *it is permitted.*
Páre, *it seems.*
C'è *or* v'è, *there is.*

CONJUGATION OF THE IMPERSONAL VERBS.

The impersonal verb *bisognáre*, to be necessary, is thus conjugated:—

Indef. *Simple Tenses.—Pres.* Bisognáre, *to be necessary.—Pres.*

Gerund. Bisognándo, *it being necessary.*—*Past Part.* Bisognáto, *needed.*——*Compound Tenses.*—*Past.* Avére bisognáto, *to have needed.*—*Past Gerund.* Avéndo bisognato, *having needed.*

IND. *Pres.* Bisógna.—*Imp.* Bisognáva.—*Ind. Pret.* Bisognò.—*Fut.* Bisognerà.—*Cond. Pres.* Bisognerébbe.

SUB. *Pres.* Che bisogni.—*Imp.* Che bisognásse.

THE PARTICIPLE.

The participle is a word which possesses the qualities both of the verb and the adjective.

The present participle terminates in *-ándo* or *-éndo*, as—

Amándo, *loving.*
Credéndo, *believing.*
Servéndo, *serving.*

The past participle ends as follows in the regular verbs :—

Amáto, -a, amáti, -e, *loved.*
Credúto, -a, credúti, -e, *believed.*
Servito, -a, serviti, -e, *served.*

The participle future is not so often used. It is as follows :—

Avére ad amáre, essére per amáre, *being about to love.*
Avere a crédere, éssere per crédere, *being about to believe.*
Avére a servire, essere per servire, *being about to serve.*

The Italians are accustomed to syncopate several past participles of the first conjugation, as—

Accóncio	*for*	acconciáto,	*fitted.*
Avvezzo	,,	avvezzáto,	*accustomed.*
Cárico	,,	caricato,	*laden.*
Créspo	,,	crespato,	*curled.*
Désto	,,	destato,	*awakened.*
Férmo	,,	fermáto,	*stopped.*
Gónfio	,,	gonfiato,	*swollen.*
Lácero	,,	laceráto,	*torn.*
Mácero	,,	macerato,	*soaked.*
Nétto	,,	nettáto,	*wiped.*
Págo	,,	pagato,	*paid.*
Prívo	,,	privato,	*deprived.*
Sálvo	,,	salvato,	*saved.*
Sázio	,,	saziato,	*satiated.*
Tócco	,,	toccáto,	*tended, touched.*
Vólto	,,	voltáto,	*turned.*
Vuóto	,,	vuotato,	*emptied.*

THE ADVERB.

The adverb is a word generally joined to a verb, participle, or adjective, to express some circumstance, quality, degree, or manner of its signification.

FORMATION OF ADVERBS.

Italian adverbs are formed from adjectives in three ways, viz :—

By uniting the substantive *mente* to the feminine of the adjectives ending in *a ;* as—

Dótto *or* dótta, *learned ;*	Dottaménte, *learnedly.*

By adding the substantive *mente* to the adjectives ending in *e* not preceded by *l ;* as—

Diligénte, *diligent ;*	Diligenteménte, *diligently.*

By joining the substantive *mente* to the adjectives ending in *le* and *re*, which lose their *e ;* as—

Fácile, *easy ;*	Facilménte, *easily.*
Particoláre, *particular ;*	Particolarménte, *particularly.*

Exception—Málo, *bad*, makes malaménte, *badly.*

VARIOUS KINDS OF ADVERBS.

In quésto instánte, in quésto punto, in témpo, *this moment.*
Óggi, *to-day.*
Presto, *quick.*
Quésta máne, quésta mattína, sta mane, sta mattina, *this morning.*

E gran pézzo, è lúnga pézza, è molto, è un pézzo, *it is a long time.*
Ier l'áltro *or* avántieri, *the day before yesterday.*
Non è guári, non ha guári, *it is not long ago.*
Poco fa, *a little while ago.*
Ultimaménte, da poco in quà, *lately.*

A dománi dunque, *to-morrow then.*
All'avvenire, *in future.*
Da qui a due mési, *in two months' time.*
Dománi a ótto, *to-morrow week.*
Domani a quíndici, *to-morrow fortnight.*
Domán l'áltro, *the day after to-morrow.*
D'óra innánzi, *henceforward.*
Posdománi, *the day after to-morrow.*
Quánto prima, *as soon as possible.*

Al più présto, *at the soonest.*
Di bel nuóvo, *again.*
Di botto, *suddenly.*
Di buon' óra, *early.*
Di continuo, *continually.*
Di giórno in giórno, *from day to day.*
Di gia, *already.*
Di quándo in quándo, di témpo in témpo, tratto, trátto, *from time to time.*
Di rádo, *seldom.*
Fin adésso, fin a quést' óra, fin ora, *hitherto.*
Giornalménte, *daily.*
In bréve, in bréve tempo, *shortly.*
In quel méntre, *in the meantime.*
In un áttimo, *all at once.*
In un bátter d'ócchio, *all of a sudden.*
Mai, *never.*
Méntre, *whilst.*
Non ancóra, *not yet.*
Per témpo, *early.*
Quándo, *when.*
Tósto, *or* présto, *soon.*

Accánto *or* a cánto, *by the side.*
A déstra, *on the right.*
Al di là, óltre, *beyond.*
Altrove, *somewhere else.*
Da ógni dove, da ógni párte, *on all sides.*
Dappertútto, in ógni parte, *every way.*
Déntro, *in* or *inside.*
Di dietro, *from behind.*
Di lì, là, *from thence.*
D'intórno, *all around.*
Dove, *where.*
Fin a quándo, *till when.*
Fin là, *till there.*
Fuori, *out.*
In disparte, a párte, da parte, da banda, *aside.*
In giù, *down.*
Innanzi *or* avánti, *before.*
Lì, là, colà, *there.*
Lungi *or* lontáno, *far.*
Quà e là, *here and there.*
Sin dóve, *how far.*
Sù in álto, di sópra, *above or upstairs.*
Verso, *towards.*

Álla rinfúsa, sossópra, *topsy-turvy.*
A vicénda, *alternately.*
Dipoi, *then.*
In séguito, di séguito, *afterwards.*
Prima *or* primieraménte, *first.*
Sopratútto, *above all.*

Abbastánza, *enough.*
Abbondantemente, *abundantly.*
Alméno, *at least.*
Círca, *about.*
Meno, *less.*
Niénte affátto, *not at all.*
Per metà, *by half.*
Più, *more.*
Presso a póco, *near abouts.*
Quási, *almost.*
Totalmente, del tútto, *entirely.*
Tróppo, *too much.*
Un pochettíno, *a little, very little.*
Un póco di méno, *a little less.*
Un po' tróppo, *a little too much.*
Un tantíno, *a little piece.*

A briglia sciólta, *at full speed.*
A caso, *by chance.*
A cavalcióni, *astraddle.*
Accortaménte, sagaceménte, *cunningly.*
A dirótte lágrime, *bitterly.*
Agevolménte, *easily.*
Álla stordita, *at random.*
A ménte, *by heart.*
Amichevolménte, *amicably.*
A piédi, *on foot.*
A próva, *in emulation.*
A tentóne, *groping along.*
A vista, in sight.
Bel béllo, adágio, *softly, gently.*
Carpóne, *upon all fours.*
Con árte, *artfully.*
Da párte a párte, da bánda a bánda, *through.*
Da sénno, *in good earnest.*
Di mála vóglia, *unwillingly.*
Fuór di luógo, *unseasonably.*
Giustaménte, *justly.*
In dubbio, *in doubt.*
Malgrádo mío, *in spite of me.*
Mirabilménte, a maraviglia, *admirably.*
Per fórza, mal volentiéri, cólle cattíve, *against one's will.*
Per il rovéscio, *the wrong side outward.*
Smisurataménte, *beyond measure.*
Supino, *on one's back.*
Temerariaménte, *rashly.*

Certaménte, di cérto, per cèrto, *certainly.*
Davvéro, veraménte, *truly.*
In cosciénza, *on my conscience.*
Non v'è dúbbio, non v'ha dúbbio, *there is no doubt.*

Sì, *yes.*
Sì in verità, *yes, indeed.*

Affátto, assolutaménte no, *by no means.*

Fórse, *perhaps.*

A guisa, a módo, *like.*
Così, *so* or *thus.*
Piu tósto, piuttósto. *rather.*

Sènza dúbbio, *without doubt.*
Senza fállo, *without fail.*

Nó, *no* or *not.*

Può dársi, può éssere, *it may be.*

Via più, viappiù, vie più, vieppiù, *still more.*

THE PREPOSITION.

The preposition is a word placed before the nouns and pronouns which it governs, and before some verbs, to connect words with one another, and to show the relation between them.

DENOTING THE CAUSE AND MEANS.

Attéso, per cagióne, *considering, on account of, owing to.*
Per mézzo, mediánte, *by, by means of, for, on condition.*
Da, dal, per via, per, *by, through.*

DENOTING THE OBJECT.

Vérso, *to, towards.*
Per, *for.* [*ing.*
Circa, *about, concerning, touch-*

DENOTING OPPOSITION.

Cóntro *or* cóntra, *against.*
Malgrádo, *in spite of.*
Nonostánte, *notwithstanding.*

DENOTING ORDER.

Avánti *or* prima, *before.*
Dópo, *after.*

Diétro, *behind.*
Fra, *between.*

DENOTING PLACE.

A, *at.*
In, *in* or *into.*
Da. *from.*
Sótto, *under.*
Sópra, *on* or *upon.*
Vérso, *towards.*

DENOTING SEPARATION.

Eccétto, fuorchè, sálvo, tránne, tráttone, *except.*
Sénza, *without.*

DENOTING UNION.

Con *or* col, *with.*
Durante, in témpo, *during.*
Óltre, *besides.*
Secondo, confórme, *according to.*

THE CONJUNCTION.

The conjunction is a word used, to connect one word with another, and sentences with sentences.

Cóme, *as.*
Nel módo che, *just.*
Similmente, *likewise.*
In óltre, *besides.*

Ancorchè, benchè, comechè, *though.*
Tuttavia, púre, per áltro, *yet.*
Ma, *but.*
Se non, *unless.*
Perciò, per quésto, *therefore.*

O—o, sía che, *either, or.*
Oppùre, ossia, ovvéro, *or, or else, either.*

A fine, affíne, *in order.*
A cagióne, *on condition.*
Perocchè, perciò che, *therefore.*

Così, *thus.*
Laónde, *therefore.*
Di maniéra che, *so that.*
In sómma, *in short.*

Ónde, dúnque, adúnque, *whence, then.*
Per tanto, *in the meantime.*

Ben intéso che, *provided.*
In cáso che, *in case that.*
Da che, poichè, póscia che, *since.*
Altrimènte, *otherwise.*

Eziandío, *also.*
In óltre, *besides.*
Oltracciò, óltre che, *besides that.*

THE INTERJECTION.

The interjection is a word which serves to express the different affections of our mind. They may be divided as follows :—

ADMIRATION.

Oh ! oh ! *oh ! oh !*
Ah ! *ha !*
Può éssere ! possíble ! *is it possible !*
Che ! *what !*
Cóme ! *how !*

AVERSION, CONTEMPT, AND DISGUST.

Oh vergógna ! *fie, for shame !*
Oibò ! *O fie !*
Eh vía ! puh ! *foh ! pish !*
Andáte, andáte ! *go, go !*
Deh ! *eh !*

AFFLICTION OR GRIEF.

Aimè ! oimè ! ohimè ! lásso ! lásso me ! *alas !*
O Dio ! *O God !*
Ah Signóre ! *ah Lord !*
Ah ! áhi ! oi ! óhi ! oh ! *ah !*
Misero me ! meschino me ! doléente me ! *unfortunate that I am !*

DERISION.

Oibò ! ciáncie ! *fiddlestick !*
Vía vía ! *pshaw !*

FEAR.

Dio mi benedica ! Dio mi sálvi ! misericórdia ! *God bless me !*
Dio buóno ! oh che giórno ! *such-a-day !*
Gran Dio ! *good Heaven !*
Oh Dio ! *oh Heaven !*
Oimè ! *alas !*
Sta ! *stop !*

JOY AND DESIRE.

Oh ! ah ! *O ! oh !*
Béne ! *well !*
Buono ! *good !*
Ah ! ah ! *ah ! ah !*
Ah ! *ah !*
Viva, víva ! eh víva ! evvíva ! *long live !*
O che allegrézza ! allegrézza, allegrézza ! *oh, what joy !*

APPROBATION OR APPLAUSE.

Béne ! *well !*
Va béne ! *very well !*
Così, *so !*
Sì ! *yes !*
Mi piace ! *very well !*
Viva ! eh viva ! *hurrah !*
Brávo ! bravissimo ! *bravo !*
Buóno ! *good !*

ENCOURAGING.

Su présto ! vía ! su vía ! via su ! orsù ! ánimo ! *come on ! come then !*

Su, su ! *now then !*
Ánimo su ! *cheer up !*
Corággio ! *courage !*

SURPRISE.

Cápperi ! cáppita ; cappiterína ! cánchero ! cánchitra ! *heyday !*
Cóme ! *how so !*
Oh ! *oh !*
Ah ! *ah !*
Per bácco ! *upon my word !*

CALLING.

Éia ! oh, oh ! *halloo !*
Èhi ! olà ! *here !*
Al fúoco ! *fire !*
Aiúto ! *help, help !*
All'ármi ! *to arms !*

WARNING.

Badáte ! guárda ! lárgo, lárgo ! óhe, óhe ! *take care !*
Ècco ! éccoti ! *behold ! lo !*
Álto ! *halt ! stay !*
Vía ! vía ! *away ! away !*
Sénti ! odi ! adágio ! *softly !*

SALUTATION.

Sálve ! salvéte ! *hail !*

SILENCE.

Sta, sta ! zitto ! tacéte ! *peace there !*
Silenzio ! chéto ! *silence !*

REMARKS ON THE SYNTAX.

THE DEFINITE ARTICLE.

The definite article il, lo, la, *the*, must agree with nouns in gender and number.

The definite article il, lo, la, *the*, is suppressed before nouns taken in a general, proverbial, usual sense, before the number of a chapter or a page, and before the title of any literary performance.

The definite article il, *the*, is suppressed before numbers denoting the succession of sovereigns.

THE INDEFINITE ARTICLE.

The indefinite article uno, una, un, *a* or *an*, must agree with nouns in gender.

The indefinite article uno, una, un, *a* or *an*, is repeated before every Italian noun.

THE PARTITIVE ARTICLE.

The partitive article di, del, dello, della, *some*, is used to express a portion or a part of anything.

The Italians use no partitive article when they express the quality or species of a noun taken in a general sense.

NOUNS.

When two nouns in English are united by the preposition *of*, di is used before the latter if it requires no article ; but if it does, it is preceded by *del*, *dello*, *della*.

If in English a noun is in the possessive case, and followed by another noun, in Italian the former is placed after the latter, preceded by *di*, *del*, *dello*, *della*, or *dei*, etc.

When two nouns are joined together in English, forming a compound noun, and showing the matter of which a thing is made, the preposition *di* is put between the two nouns.

ADJECTIVES.

The adjective in Italian agrees in gender and number with the substantive to which it refers.

When an adjective refers to several nouns of inanimate objects, without being separated by a verb, it agrees with the noun next to it.

COMPARATIVES AND SUPERLATIVES.

COMPARATIVES.

When, in a comparison, *than* is followed by an article, or a possessive pronoun, it is expressed by the definite articles *del*, *dello*, *della*, *dei*, *degli*, *delle*.

When a comparison is made between two adjectives, substantives, or adverbs, following one another, *than* is expressed by *che;* and if there is a verb after *than*, this conjunction is rendered by *che non*.

When *as much as*, *so as*, are employed in a comparison, they must be rendered by *quanto*.

SUPERLATIVES.

The relative or absolute superlatives are placed either before or after their substantives.

NUMERALS.

THE CARDINAL NUMBERS.

The cardinal numbers are placed either before or after their substantives.

THE ORDINAL NUMBERS.

The ordinal numbers are placed before their nouns, and agree with them in gender and number, and take an article.

The ordinal numbers employed for quotations are generally put after their nouns, without an article.

PERSONAL PRONOUNS.

When the personal pronouns *io*, *tu*, *noi*, *voi*, are the subjects of a discourse, they may be left out; but *egli*, *ella*, *eglino*, *elleno*, *esso*, *essa*, *essi*, *esse*, must be expressed in order to distinguish the gender.

ITALIAN FORMS OF ADDRESSING PERSONS.

The Italians in speaking or writing to persons of both sexes, whom they wish to treat with great respect, make use of the title Vossignoria,* *or* Vostra Signoria, *your lordship* or *ladyship*. As this flattering title is in the third person of the feminine gender, it requires the verb in the third person, and agrees with the adjective or past participle.†

To avoid the repetition, or better to avoid the word *vossignoria*, the Italians make use of *ella*, as is seen in the following illustration:—

Singular (for both Genders).

Nom.	Vossignoria, V. S, *or* ella, *you* (*sir* or *madam*)
Gen.	Di vossignoria, V. S., *or* di lei, *of you.*
Dat.	A vossignoria, V. S., *or* a lei *or* le, *to you.*
Acc.	Vossignoria, V. S., *or* lei *or* la, *you.*
Abl.	Da vossignoria, V. S., *or* da lei, *from you.*

Plural.

	MASCULINE.	FEMININE.
Nom.	Lor signori;	Lor signore, *you.*
Gen.	Di lor signori;	Di lor signore, *of you.*
Dat.	A lor signori;	A lor signore, *to you.*
Acc.	Lor signori;	Lor signore, *you.*
Abl.	Da lor signori;	Da lor signore, *from you*

MASCULINE AND FEMININE.

Nom.	Le signorie loro, *or* elleno, *you.*
Gen.	Delle signorie loro, *or* di loro, *of you.*
Dat.	Alle signorie loro, *or* a loro, *to you.*
Acc.	Le signorie loro, *or* loro, le, *you.*
Abl.	Dalle signorie loro, *or* da loro, *from you.*

EXAMPLES.

Ella mi disse che era soddisfatta, *you told me that you were satisfied.*

Come sta V. S. *or* ella? *how do you do, sir*, or *madam?*

Io ringrazio V. S. *or* lei, *or* io la ringrazio, *I thank you, sir*, or *madam.*

Sono lor signori stati in campagna? *have you been in the country, gentlemen?*

Ho veduto le sue sorelle, *I saw your sisters, sir*, or *madam.*

Parents to their children; husbands to their wives; brothers, sisters, cousins, intimate friends to each other—all make use of the second person singular. Poets, and people in a passion, do not fail to employ it.

POSSESSIVE PRONOUNS.

The possessive pronouns are generally preceded by the definite article *il*, *lo*, or *la*.

The possessive pronouns must agree in gender and number with their substantives.

The possessive pronouns may be put either before or after the substantives with which they agree.

The possessive pronouns preceded by *ogni*, *qualche*, *alcuno*, *molto*, *questo*, *quello*, *quegli*, *uno*, *due*, *tre*, have no article.

No article generally precedes the possessive pronouns when the latter are prefixed to substantives which express (1st) kindred or relation, such as *padre*, *madre*, *figlio*, *sorella*, *marito*, etc.; (2nd) the rank and quality, such as *altezza*, *eccellenza*, *maestà*, etc.

When the possessive pronouns follow the above substantives, *padre*, *madre*, etc., or precede the same in the plural, then the article is used.

Speaking of any part of the body, whole, sick, or wounded, instead of the possessive pronouns as in English, the Italians use *il*, *lo*, *la*.

DEMONSTRATIVE PRONOUNS.

The demonstrative pronouns *he who*, *she who*, *they who*, are expressed by *colui che* or *chi*, *colei che*, *quelli che*, *quelle che*, and *that which* or *what* by *ciò che*.

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* This word is seldom used in polite society.

† In conversation especially, *Vossignoria* or *Vostra Signoria*, is now very seldom used.

RELATIVE PRONOUNS.

The relative pronoun *who, that,* or *which,* is expressed in Italian by *che,* when it is the subject or regimen direct of a verb, or by *di cui, a cui, da cui,* when used in the genitive, dative, or ablative cases.

The relative pronoun *quale,* used for persons or things, is declined with the article *il* or *la,* and agrees with its antecedent in gender and number.

ENGLISH LITERATURE.—XIII.

[*Continued from p. 5*]

THE ELIZABETHAN PERIOD: THE DRAMATISTS.

MASSINGER, FORD, WEBSTER, AND OTHERS.

PHILIP MASSINGER was born at Salisbury in 1584, and was the son of a gentleman who had long been employed in the household of the Earls of Pembroke. He spent some years at Oxford; but after the close of his course there he seems, probably under the pressure of poverty, to have at once devoted himself to the dramatic profession. At the beginning of his career it seems likely that he followed the common course of writing in concert with others; and having established his reputation by this means, he probably advanced to purely independent authorship. It is plain that he lived in great poverty; and from his works there can be little doubt that he must have become a Roman Catholic at an early age, and continued in that creed through his life. But beyond this we know nothing of his personal history. He died in 1640.

Massinger is unquestionably entitled to a very high place among the Elizabethan dramatists. In the creation of life-like characters, in insight into human nature, in the expression of passion, in the power of pathos, and of arousing our sympathy for the errors and weaknesses no less than for the virtues of humanity, he falls short of many of his contemporaries. His skill lay more in depicting the loftier virtues. In his greatest plays, and those which most powerfully impress the reader, we generally feel more of admiration for the fortitude than pity for the sufferings of the hero. Our sympathy is given rather by an act of the judgment than won through our emotions. The stories of Massinger's plays are seldom original, but the plots are carefully worked out; there is too often, however, a want of unity of effect, a want of harmony between the various parts of the play. Massinger's language and versification are wonderfully perfect. His versification combines smoothness and melody with ease and variety to a degree which has never been surpassed; while his style is clear and unaffected, but at the same time dignified and impressive. His learning may easily be traced, but is never obtruded upon us. In one respect Massinger stands above almost all his brother dramatists—that is, in the religious spirit and the purer tone of morality which pervade his plays. Yet he is not free from the one all-prevailing vice of his age—the introduction of scenes of the lowest and coarsest buffoonery, unredeemed in his case by a single spark of wit or humour, and for the most part mere purposeless excrescences upon the plays in which these objectionable interpolations occur.

PHILIP MASSINGER.

Eighteen of Massinger's plays have been preserved, and a still larger number have perished. Those which remain to us are of very various classes.

The Virgin Martyr (1622) demands particular notice, not only because it is one of the plays by which the name of Massinger is best known, but because it is very different in character from any other play of the age in which it was written. The scene is laid in Cæsarea, in the midst of the great Diocletian persecution, and the main human characters are the virgin martyr Dorothea, Theophilus, the chief of the persecutors, and other persons connected on one side or the other with the persecution. But the real subject of the play is the conflict of good and evil, and the triumph of good, not in the world, but over it. The real leaders of the conflict in Cæsarea are Angelo (an angel passing as the page of Dorothea) and Harpax (a demon disguised as the servant of Theophilus). The stage is crowded with murders, tortures, and every form of physical cruelty, to an extent that would be simply revolting if we missed the key-note of the whole. That key-note is the victory of Christian faith in and through pain and death, and virtue finding as its reward suffering in this world, happiness in the next. Miracles are ordinary incidents of the play. Theophilus himself is at its close converted by the visit of an angelic messenger, bearing him a basket of fruits and flowers from the gardens of Paradise. It is difficult to conceive anything more entirely out of harmony with the whole tone of thought and feeling in England under James I. than *The Virgin Martyr*. The play is as powerful as it is strange, and there is no doubt that it was a popular piece.

Of tragedies, in the strictest sense of the term, there are a considerable number among Massinger's plays. The finest of these are probably *The Duke of Milan* (1623), *The Unnatural Combat*, and *The Fatal Dowry;* and we can hardly recommend to the student a better example of Massinger's powers in tragedy than the last-mentioned of these plays. It opens with several very powerful scenes, in which the hero, Charalois, is introduced in extreme distress, sacrificing his own liberty to save his father's corpse from his exacting creditors, and secure for it the common decencies of burial. He is rescued from his calamities, and his debts are paid by the noble and wealthy Rochfort, who crowns his favours by giving his daughter in marriage to Charalois. The infidelity of Beaumelle, the vengeance of her husband upon herself and her paramour, Novall, and the death of Charalois at the hands of Novall's friend, form the story of the play. Painful as that story is, the mode in which it is conducted is characteristic of Massinger. There is no tampering with the bounds of right and wrong; none even of that gross and animal character about the heroine's fall which we so often find in Fletcher's plays. The husband whom Beaumelle wrongs is not the husband of her choice, but a stranger imposed upon her by her father's will. The man for whom she sacrifices her honour is the man whom she had loved before marriage. Her repentance and her punishment are rapid and thorough. Nor is hers the only character in which similar principles are to be traced; the moral lessons of the play are in all cases clear and true. The following lines from the speech of Charalois to his judges, when arraigned before them for the death of his wife and her paramour, afford a good example of Massinger's style:—

"Then I confess, my lords, that I stood bound,
When, with my friends, even hope itself had left me,
To this man's charity for my liberty.
Nor did his bounty end there, but began;
For, after my enlargement, cherishing
The good he did, he made me master of
His only daughter and his whole estate—
Great ties of thankfulness, I must acknowledge.
Could any one fee'd by you press this further?
But yet consider, my most honoured lords,
If to receive a favour make a servant,
And benefits are bonds to tie the taker
To the imperious will of him that gives,
There's none but slaves will receive courtesies,
Since they must fetter us to our dishonours.
Can it be called magnificence in a prince
To pour down riches with a liberal hand
Upon a poor man's wants, if that must bind him
To play the soothing parasite to his vices?
Or any man, because he saved my hand,
Presume my head and heart are at his service?
Or did I stand engaged to buy my freedom
(When my captivity was honourable)
By making myself here, and fame hereafter,
Bond-slaves to men's scorn and calumnious tongues?
Had his fair daughter's mind been like her feature,
Or, for some little blemish I had sought
For my content elsewhere, wasting on others
My body and her dower, my forehead then
Deserved the brand of base ingratitude;
But if obsequious usage, and fair warning
To keep her worth my love, could not preserve her
From being a whore—and yet no cunning one,
So to offend, and yet the fault kept from me—
What could I do? Let any free-born spirit
Determine truly, if that thankfulness,
Choice form, with the whole world given for a dowry,
Could strengthen so an honest man with patience,
As with a willing neck to undergo
The insupportable yoke of slave or wittol."

Of the death of his guilty rival he says:—

"For the last, as of
The former, I confess it; but with what
Base wrongs I was unwillingly drawn to it,
To my few words there are some other proofs
To witness thus for truth. When I was married—
For there I must begin—the slain Novall
Was to my wife, in way of our French courtship,
A most devoted servant; but yet aimed at
Nothing but means to quench his wanton heat,
His heart being never warmed by lawful fires,
As mine was, lords; and though, on these presumptions,
Joined to the hate between his house and mine,
I might, with opportunity and ease,
Have found a way for my revenge; I did not.
But still he had the freedom as before,
When all was mine. And, told that he abused it
With some unseemly licence, by my friend—
My approved friend, Romont—I gave no credit
To the reporter, but reproved him for it,
As one uncourtly and malicious to him.
What could I more, my lords? Yet, after this,
He did continue in his first pursuit,
Hotter than ever, and at length obtained it.
But how it came to my most certain knowledge,
For the dignity of the court, and mine own honour,
I dare not say."

FORD.

Somewhat similar to Massinger in the character of his genius was his contemporary, John Ford. He was born in 1586, of a respectable Devonshire family. In 1602 he became a member of the Middle Temple, but it does not appear that he ever actually joined the bar. It is clear, from the dedications prefixed by Ford to his various plays, that literature was not his sole pursuit in life, though what his other employments were cannot be certainly ascertained; and as he had wealthy and influential connections, being the grandson on his mother's side of Popham, the Chief Justice of England, it is probable that he never felt the burden of poverty under which most of his fellow-dramatists laboured. These circumstances, together with a sensitive and reserved disposition, are quite sufficient to explain the fact of Ford's having written comparatively few pieces for the stage. Those which he has left us are, however, abundantly sufficient to stamp him as a great dramatist. The bent of his genius is essentially tragic. In depicting blighted affections, disappointed ambition, in everything that appeals to our pity, he is masterly. In wit and humour he is wholly deficient. His language and versification have a peculiar power and beauty, and are admirably adapted for conveying those images of tenderness and pity in which he delighted. The plays of Ford which will probably give the greatest pleasure to most readers are the historical play of *Perkin Warbeck*, *The Broken Heart*, and a play frightful in subject, but singularly powerful and noble in execution—*Annabella and Giovanni*, known also by several other names.

WEBSTER.

The genius of John Webster was one of the most striking in its character, even more than in its power, among all those that adorned the Elizabethan age. Of Webster's personal history we know nothing; the time or place of his birth or of his death, his parentage, the circumstances of his life, his social position and habits, cannot be ascertained. And this is especially disappointing in the case of one whose works are marked with so strong an individuality as Webster's. We merely know of him that he was a contemporary of Massinger, Ford, and the rest of the younger school of Elizabethan dramatists. There is little doubt that he was at times employed either to work with other dramatists in the composition of plays, or to improve upon the works of earlier authors, as well as producing plays wholly his own. The works of Webster which have come down to us are few; and though some others have been lost, there is no reason to suppose that he was ever a very voluminous writer.

Among all the Elizabethan dramatists there is no other who so strongly reminds us of Shakespeare as Webster, and none, probably, who in a certain department stands so nearly on a level with Shakespeare. Not that anyone would be justified in comparing the two in respect of the general scope of their powers: Shakespeare's genius is, above all things, many-sided; he is equally at home in gloom and in sunshine, in portraying the anguish of Lear or Othello, or the bright fairyland of the *Midsummer Night's Dream*. The music of Webster is all in one key—a key of profound melancholy and tragic horror. His lightest mood is that expressed in his own words:—

> "I do love these ancient ruins.
> We never tread upon them but we set
> Our foot upon some reverend history;
> And questionless, here in this open court,
> Which now lies open to the injuries
> Of stormy weather, some men lie interred
> Loved the church so well, and gave so largely to it,
> They thought it should have canopied their bones
> Till Doomsday. But all things have their end:
> Churches and cities, which have diseases like to men,
> Must have like death that we have."

But in pure tragedy Webster is a consummate master. He can ransack nature and the supernatural world, giving free play to a most active imagination and endless ingenuity, to accumulate images of horror; yet without ever overstepping the line dividing that which fascinates by its horror and sadness from that which disgusts, for with Webster the physical is always subordinate to the moral, the physical suffering a mere accessory to the mental anguish. He has a marvellous power of painting character from the true tragic point of view, character under the tension of passion, minds not only noble in suffering, but ennobled by suffering. And his style is in harmony with the subject which he chooses, always dignified and expressive, full of variety in its imagery, yet always in the same key of sadness.

The greatest of Webster's works are *The White Devil or Vittoria Corombona* and *The Duchess of Malfi*. The former of these is a very remarkable play, especially in the mode in which the character of Vittoria is conceived and worked out. *The Duchess of Malfi* is one of the most powerful plays in our language. The outlines of its story are simple. The widowed Duchess of Malfi is secretly married to her steward, Antonio, a husband, but for his birth, in every way worthy of her. This marriage comes to the knowledge of her two brothers, Duke Ferdinand and the Cardinal, two men whose characters—the coarse pride and passionate cruelty of the one, and the cold selfish cunning of the other—are admirably contrasted.

They determine to be avenged; they succeed in separating the husband and wife, banishing the husband, and seizing and imprisoning the wife. To her they apply every kind of mental torture which ingenuity could devise, and ultimately strangle her and her younger children in prison. Of this part of the play Charles Lamb well wrote:—"All the several parts of the dreadful apparatus with which the duchess's death is ushered in are not more remote from the conceptions of ordinary vengeance than the strange character of suffering which they seem to bring upon their victim is beyond the imagination of ordinary poets. As they are not the inflictions of this life, so her language seems not of this world. She has lived among horrors till she has become 'native and endowed unto that element.' She speaks the dialect of despair; her tongue has a smatch of Tartarus and of the souls in bale. What are Luke's iron crown, the brazen bull of Perillus, Procrustes' bed, to the waxen images which counterfeit death, to the wild masque of madmen, the tomb-maker, the bellman, the living person's dirge, the mortification by degrees! To move a horror skilfully, to touch a soul to the quick, to lay upon fear as much as it can bear, to wean and weary a life till it is ready to drop, and then step in with mortal instruments to take its last forfeit—this only a Webster can do. Writers of an inferior genius may 'upon horror's head horrors accumulate,' but they cannot do this. They mistake quantity for quality, they 'terrify babes with painted devils,' but they know not how a soul is capable of being moved; their terrors want dignity; their affrightments are without decorum." And the Nemesis which overtakes the guilty brothers is hardly less powerfully drawn than the sufferings of their victim. One brother, under the terrors of a guilty conscience, is smitten with that form of madness once so universally believed in—lycanthropy:—

"In those that are possessed with 't, there o'erflows
Such melancholy humour, they imagine
Themselves to be transformed into wolves;
Steal forth to churchyards in the dead of night,
And dig dead bodies up.'

Both brothers ultimately fall by the hand of the man who had been the instrument of their crimes; while he, in turn, after aggravating the remorse which tormented him by accidentally killing Antonio, falls by the hand of the madman.

Our space does not allow us to illustrate this play by many quotations, and, of course, extracts would at best convey but little idea of its effect. Webster seems to have concentrated his power especially upon the character of the duchess, and her language is naturally the most characteristic of the author. What can be more pathetic than her protest against her brothers' tyrannical hostility to her marriage?—

"The birds that live in the field,
On the wild benefit of nature, live
Happier than we: for they may choose their mates,
And carol their sweet pleasures to the spring."

In her height of misery she exclaims—

"Oh, that it were possible we might
But hold some two days' conference with the dead!
From them I should know somewhat, I am sure,
I never shall know here. I'll tell thee a miracle;
I am not mad yet to my cause of sorrow.
The heaven o'er my head seems made of molten brass,
The earth of flaming sulphur; yet I am not mad.
I am acquainted with sad misery,
As the tanned galley-slave is with his oar:
Necessity makes me suffer constantly,
And custom makes it easy"

THE MINOR DRAMATISTS.

The drama of the Elizabethan age would be very insufficiently estimated if it were judged only by the greatness of its greatest men; it was no less conspicuous for the number of names of striking, though inferior merit. It would be impossible in such lessons as these to give any full account of the dramatists of this class; but there are some whose names, at least, ought not to be passed by. Middleton was a very prolific writer, and his comedies especially are of great merit. The serious dramas of Marston are manly and vigorous. Decker must have been one of the most active writers of his day; but he wrote chiefly in conjunction with others, and there is hardly one of the better known Elizabethan dramatists with whom he was not at some time a coadjutor. Chapman, whom we have already mentioned as a poet and the translator of Homer, was in his own day not less popular as a dramatist. Tourneur, the least, and Heywood, almost the most, voluminous writer of the day, would have acquired higher fame in any age but that in which they lived.

The following is a brief specimen of Heywood's writing, selected from a prologue to one of his numerous plays. What he says of the sources from which he derived the plots of his plays, and the characters that figure in them, may be said of all the dramatists of the Elizabethan period:—

"To give content to this most curious age,
The gods themselves we've brought down to the stage,
And figured them in planets; made even hell
Deliver up the furies, by no spell
Saving the Muse's rapture—further we
Have trafficked by their help; no history
We have left unrifled; our pens have been dipped
As well in opening each hid manuscript
As tracks more vulgar, whether read or sung
In our domestic or more foreign tongue:
Of fairies, elves, nymphs of the sea and land

The lawns, the groves, no number can be scanned
Which we have not given feet to."

The last of the great race of dramatists was Shirley, who was born at the close of the reign of Elizabeth, lived through the whole period of the civil contests and the Commonwealth, and survived by some years the Restoration. We possess no less than forty of his plays; they are in no respect entitled to rank with the works of the great masters among whom Shirley's youth was passed.

THE CIVIL WAR AND THE COMMONWEALTH: PROSE.

The period upon which we are now entering presents in the character of its literature the strongest contrast to that which preceded it. In the Elizabethan age we saw the nation for the first time fully roused from the long torpor of the dark ages, and brought under the influence of that great intellectual revival which throughout all Europe accompanied the restoration of learning. We saw the nation, in the new-found strength of its early manhood, seeking a vent for its energies in war, in travel, in discovery, and above all in literature. In its literature we find an eager pursuit of knowledge for its own sake; a keen search for every form of artistic beauty and intellectual pleasure. A period of great prosperity and unexampled national glory left the genius of the age free to pursue its own ends in its own ways. Controversies there were, no doubt, and of no small importance, but they had not yet made their way into the hearts of the people, or pressed the literary powers of the nation into service on either side; and consequently the leading characteristics of the literature of the period are, besides its power and extent, above all things, freedom and variety. In the period to which we now come everything is changed. A conflict, such as England had never seen since the miserable days of the Wars of the Roses, divided and exhausted the nation. Men opposed one another, not from mere prejudice in favour of this or that candidate for power: their differences lay deeper. In religion they began with the very bases of belief, included the whole of their creed and forms of worship, and extended to the minutest details of practice. Nor were men less profoundly divided upon all that relates to the political and social constitution. And these contests were so engrossing as to absorb, or at least direct, the whole intellectual energy of the nation. The most striking qualities in the literature of the Civil War and the Commonwealth are earnestness and concentration, and an intensely religious spirit. Shakespeare is, in literature, the leading spirit of the one age, Milton of the other.

One special circumstance affecting the character of this literature, and strengthening the contrast between it and the preceding age, ought not to be overlooked. The great glory of the Elizabethan period was its drama. The dominance of the Puritans was the death of the drama; the fanatics of that party closed the theatres and proscribed the dramatic profession.

It follows naturally from the character of the times that the prose literature bears a far higher proportion, both in extent and in importance, to its poetry than in any former age.

The controversy between Protestantism and the Church of Rome, a controversy which in the preceding generation had been carried on with very different weapons, now largely occupied the deepest thinkers and most learned men of the age; and scarcely less absorbing was the contest between the three chief schools within the ranks of Protestantism in England, the Episcopalians, Presbyterians, and Independents, even Milton himself having, as we shall see hereafter, thrown all his energies into this latter controversy.

John Hales was born towards the close of the reign of Elizabeth, in the year 1584, and lived till nearly the end of the Commonwealth, in 1655. He was a divine of vast learning and great powers as a reasoner, and his style is admirable. As a controversialist, he took the Episcopalian side, as against the strongly Puritan parties, and, like all other men of that day who expressed their own opinions boldly and openly, he suffered much for his honesty when his opponents were in power. He was also a determined antagonist of the claims of the Church of Rome.

Scarcely less famous than Hales in his own day, and even more so with posterity, was his contemporary, William Chillingworth (b. 1602, d. 1644). Chillingworth, while a young man, was converted to the Roman Catholic religion, but he subsequently returned to his original faith, and became one of its most powerful champions against the Roman system. His great work is an elaborate defence of the Protestant position, entitled "The Religion of Protestants a Safe Way to Salvation."

But by far the most important to the student of literature among the theological writers of this period is Jeremy Taylor. Taylor was born at Cambridge, in 1613, of very humble parentage. He received his education first at a grammar school in that town, and afterwards at Caius College in the university. The great reputation which he acquired at the university, followed, it is said, by an accidental introduction to Archbishop Laud, led to his advancement in the Church and his connection with the Court party. Throughout the Civil War he attached himself to the party of the King, and, as chaplain to the army, followed the fortunes of his royal master in the field. After the final triumph of the Parliament over the King, Taylor lived for the most part in retirement; but, as he continued to write freely in opposition to the dominant party, he sometimes suffered for his opinions at their hands. After the Restoration, Taylor's fidelity to the royal cause was rewarded by his appointment to the bishopric of Down and Connor. He died in Ireland soon afterwards, in 1667.

Among all the great men whom the Church of England has produced, there is none to whom the members of that Church are accustomed to look up with more affectionate admiration and pride than Jeremy Taylor. It is not alone his genius, but still more the purity and beauty of his character and the devotion of his life, which have secured for him this regard. And his works hold almost, if not quite, the first place among the standard classics of his Church. He was a very voluminous writer, and his works are of various classes. His devotional works are those which are in the present day the best known, and upon which his fame mainly rests. The chief among them are "The Rule and Exercise of Holy Living"; "The Rule and Exercise of Holy Dying"; and "The Life of Christ, the great Exemplar." His numerous sermons, though less generally read in the present day than the works we have mentioned, are fully equal to them in beauty and power. Of his works of an argumentative character, the most noteworthy are his "Apology for Fixed and Set Forms of Worship," a work whose purpose sufficiently appears from its title; and his "Liberty of Prophesying," an argument in favour of religious toleration. The student of literature who desires to form some idea of Jeremy Taylor's powers cannot do better than select the last-named book for study. In judging of the real liberality of Taylor's principles, it must be remembered, however, that when he wrote this book he was on the beaten side, and the weaker party is always and necessarily in favour of toleration. On the other hand, when we see the narrow limits within which Taylor would confine toleration, we must bear in mind the age in which he wrote, and that in limiting toleration as he does, he did only what the most advanced thinkers of his age did. Milton asserts these restrictions upon toleration more strongly than Taylor does. Taylor was exceptional in the clear doctrines of toleration which he laid down, not in the qualifications which he placed upon them.

The peculiar merit of Jeremy Taylor's writings is the marvellous beauty of his style. In this he stands, probably, foremost in the golden age of English prose. It is true that he is not always free from pedantry; and one cannot find in Taylor single passages of such surpassing splendour as may be met with in Milton's prose works. Taylor's great power lies in the equal flow of his eloquence, never deformed by harshness or crabbedness, always musical and always dignified, unfailing in wealth of illustration and in variety of structure. For this very reason, because his charm lies not so much in the peculiar beauty of isolated passages as in the sustained eloquence of the whole, few great writers suffer more in quotation than Taylor. But a few passages may give some idea of his style. We select them from the "Liberty of Prophesying." Speaking of the strength of early habits and education, and the consequent tenderness with which early-learned errors ought to be treated, he writes :—

> "Education is so great and so invincible a prejudice that he who masters the inconvenience of it is more to be commended than he can be justly blamed that complies with it. For men do not always call them principles which are the prime fountains of reason, from whence such consequents naturally flow as are to guide the actions and discourses of men; but they are principles which thus are first taught, which they sucked in next to their milk, and by a proportion to those first principles they usually take their estimate of propositions. For whatsoever is taught to them at first they believe infinitely, for they know nothing to the contrary. They have had no other masters whose theorems might abate the strength of their first persuasions; and it is a great advantage in those cases to get possession; and before their first principles can be dissolved, they are made habitual and complexional. It is in their nature then to believe them; and this is helped forward very much by the advantage of love and veneration which we have for the first parents of our persuasions. . . . Now this prejudice works by many principles; but how strongly they do possess the understanding is visible in that great instance of the affection and perfect persuasion the weaker sort of people have to that which they call the religion of their forefathers. You may as well charm a fever asleep with the noise of bells, as make any pretence of reason against that religion which old men have entailed upon their heirs male so many generations till they can prescribe. And the apostles found this to be most true in the extremest difficulty they met with, to contest against the rites of Moses, and the long superstition of the Gentiles, which they therefore thought fit to be retained because they had done so formerly, *pergentes non quo eundum est sed quo itur*; and all the blessings of this life which God gave them they had in conjunction with their religion, and therefore they believed it was for their religion. And this persuasion was fast bound in them with ribs of iron. The apostles were forced to unloose the whole conjuncture of parts and principles in their understandings, before they could make them malleable and receptive of any impresses. But the observation and experience of all wise men can justify this truth. All that I shall say to the present purpose is this, that consideration is to be had to the weakness of persons when they are prevailed upon by so innocent a prejudice; and when there cannot be arguments strong enough to overmaster an habitual persuasion bred with a man, nourished up with him, that always eat at his table, and lie in his bosom, he is not easily to be called heretic; for if he keeps the foundation of faith, other articles are not so clearly demonstrated on either side but that a man may innocently be abused to the contrary;

> and therefore, in this case, to handle him charitably is but to do him justice. And when an opinion *in minoribus articulis* is entertained upon the title and stock of education, it may be the better permitted to him, since upon no better stock nor stronger arguments most men entertain their whole religion —even Christianity itself."

Very characteristic of the writer is the beautiful story with which the book concludes:—

> "I end with a story which I find in the Jews' books. When Abraham sat at his tent door, according to his custom, waiting to entertain strangers, he espied an old man stooping and leaning on his staff, weary with age and travel, coming towards him, who was an hundred years of age. He received him kindly, washed his feet, provided supper, caused him to sit down; but observing that the old man ate and prayed not, nor begged for a blessing on his meat, he asked him why he did not worship the God of heaven. The old man told him that he worshipped the fire only, and acknowledged no other god; at which answer Abraham grew so zealously angry that he thrust the old man out of his tent, and exposed him to all the evils of the night and an unguarded condition. When the old man was gone, God called to Abraham, and asked him where the stranger was. He replied, 'I thrust him away because he did not worship thee.' God answered him, 'I have suffered him these hundred years, although he dishonoured me, and couldest thou not endure him one night when he gave thee no trouble?' Upon this, saith the story, Abraham fetched him back again, and gave him hospitable entertainment and wise instruction. Go thou and do likewise, and thy charity will be rewarded by the God of Abraham."

ARCHITECTURE.—XI.

[Continued from p. 10.]

THE ITALIAN, OR RENAISSANCE, STYLE.

BEFORE proceeding to describe the buildings of the Italian Renaissance, it is necessary to point out that between the old traditional styles in each country and the introduction of the pure Italian there existed, as with other styles, a transitional period—a period during which the ornament and leading features of the new style were employed in a decorative sense and in the spirit of the old traditional work. This period is known in Italy as the Cinque-Cento style; in France as the style of Francis I.; in Spain as the Plateresque, or silversmith's, style; and in England as the Elizabethan and Jacobean. The latest revival which has taken place in this country, and to which we shall refer again, is based on this transitional period, and many of its models are to be found in Belgium and Holland, two countries, curiously enough, in which the pure Italian style never seems to have taken a footing.

The Cinque-Cento style in Rome is found only in tombs by Sansovino and other sculptors who were unwilling to bind their fancies by the rules laid down by Vitruvius. In the north of Italy it is found in the court of the Palazzo Vecchio at Florence (Fig. 40), in the arcades of Bologna, in the town-hall and church of Santa Maria-dei-Miracoli at Brescia, in the Certosa at Pavia, in the dome and apses of Santa Maria-delle-Grazie at Milan, in the ducal palace at Urbino, and in other towns; the greatest variety, however, being found in Venice, which, probably owing to the much greater perfection of the Gothic style in her palaces, seems to have clung to the traditional feeling which still lingered there. Thus, we have in the church of the Miracoli, in St. Zaccharia and St. Giobbe, in the later portions of the Ducal Palace, in the schools of San Rocco and San Marco, and in the Vendramini Calerghi and Corner-Spinelli Palaces, a large series of Cinque-Cento buildings of the greatest beauty—buildings in which the design is based on Gothic principles, whilst the ornament and details are adapted from classic examples, treated, however, with perfect freedom, and with a delicacy and beauty in the carving which has never since been approached, except, perhaps, in some of the early French buildings of the first half of the sixteenth century.

Although, as will be seen later on when dealing with the Italian style in France and England, domestic or secular architecture supersedes the ecclesiastical buildings of past styles, in Italy the chief revival of classic architecture was developed in her churches, and of these there were two types: (1) the basilican church, with nave and aisles separated from one another by columns carrying arches, and covered with an open timber-roof or with flat-panelled ceiling; and (2) a church with barrel-vault over the nave, which was separated from the aisles by massive piers with arched openings between, the aisles also being vaulted. Since the early basilican days, the transept, originally at the east end, had been brought forward and given up to the laity or the congregation, and the space behind it, called the choir, had been appropriated by the priests; already in the beginning of the fourteenth century, at Florence, in the church of Santa Maria-dei-Fiori, the architect had conceived the idea of giving more importance to the centre of the church by the erection of a dome, of which so magnificent an example existed in the Pantheon at Rome; and the first feature of the new Italian style was the great dome which Brunelleschi erected on the structure commenced by Arnoldo di Lapo at Florence, and for the design and construction of which he made a special study of the earlier Roman example (Fig. 41). The diameter of the Florence dome is only one foot less than that of the Pantheon. The height of its springing is far greater, being 180 feet from the ground, and the height to summit of vault is 280 feet. It was, therefore, a work of extraordinary magnitude, and, as might have been expected, served as a model for that which the Italian architects may almost claim to have invented, viz.,

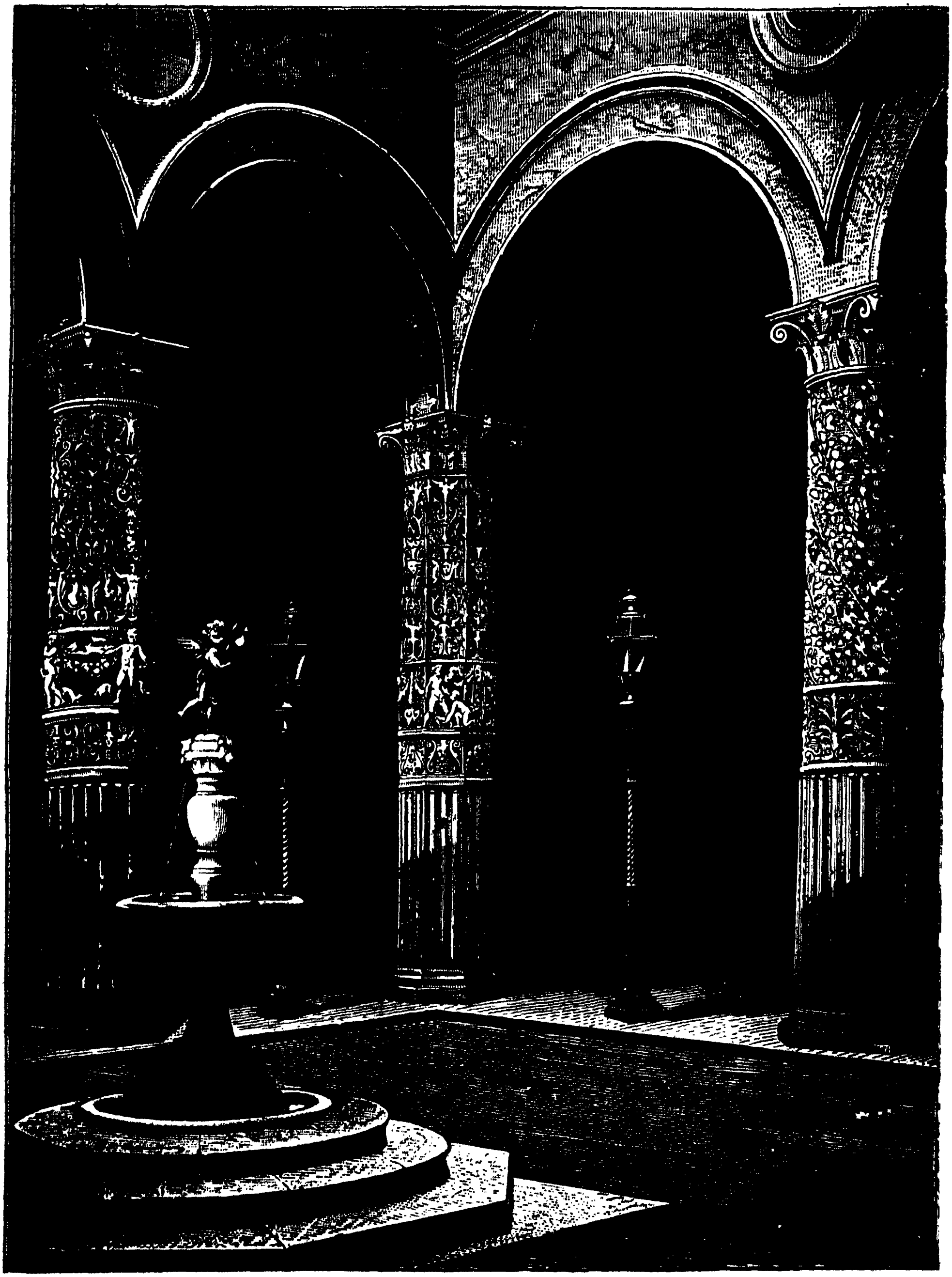


Fig. 41.—Courtyard of the Palazzo Vecchio, Florence.

the erection of a dome on the intersection or crossing of the nave and transept of a church. The two other churches which Brunelleschi designed at Florence were those of St. Lorenzo (which he completed) and of St. Spirito, both of the basilican type. As an early example of the barrel-vaulted church, we may mention the church of St. Andrea at Mantua, by Alberti; this is crowned by a small dome at the crossing. The chief interest of the ecclesiastical revival of classic architecture centres in the cathedral of St. Peter's at Rome, one of the most stupendous structures in existence, being 650 feet long and covering an area of 227,000 square feet—more than double the area of Milan Cathedral, four times the area of Salisbury Cathedral, and nearly three times the area of St. Paul's Cathedral, London. (Figs. 42, 43.) It occupies the site of the original St. Peter's, erected by Constantine, the tribune or apse of that church lying under the central dome of the new building The foundations of a portion of the building in the west apse (the church is orientated after the early custom, the entrance porch at the east end and the apse at the west end) were laid by Nicholas V. about 1440; but little was done for half a century, when Pope Julius II. commissioned Bramante to prepare designs for the structure, the foundations of which were laid in 1506. Bramante died in 1514, and other architects (Raphael, Peruzzi, and San Gallo) were successively appointed to succeed him. In 1546 the building was placed in the hands of Michael Angelo, who constructed the dome, and probably a great portion of the exterior, on the same lines as Bramante's plan, except that the Greek instead of the Latin cross was adhered to—that is to say, the nave, the choir, and the north and south transepts were each of the same length. In the beginning of the seventeenth century the nave was increased in length by three bays, and a narthex or entrance vestibule was built by Maderno; and in 1661 Bernini added the piazza, with its semicircular porticos and its fountains. The lengthening of the nave has been fatal to its external effect so far as the dome is concerned, which is almost entirely hidden from the piazza; in fact, the rear elevation is the only side from which its form can be properly seen. The nave, choir, and transept are all covered with barrel-vaults. The dome is 138 feet in diameter, its height to the summit of the vault 330 feet. The size of the interior is diminished in effect by the enormous height of the Corinthian pilasters, which are 105 feet in height; and although the richest marbles and sculptures are employed in its decoration, the general aspect is not of a religious nature. Of other churches we may mention the church of St. Maggiore, of the Salute at Venice, and of the Annunziata at Genoa.

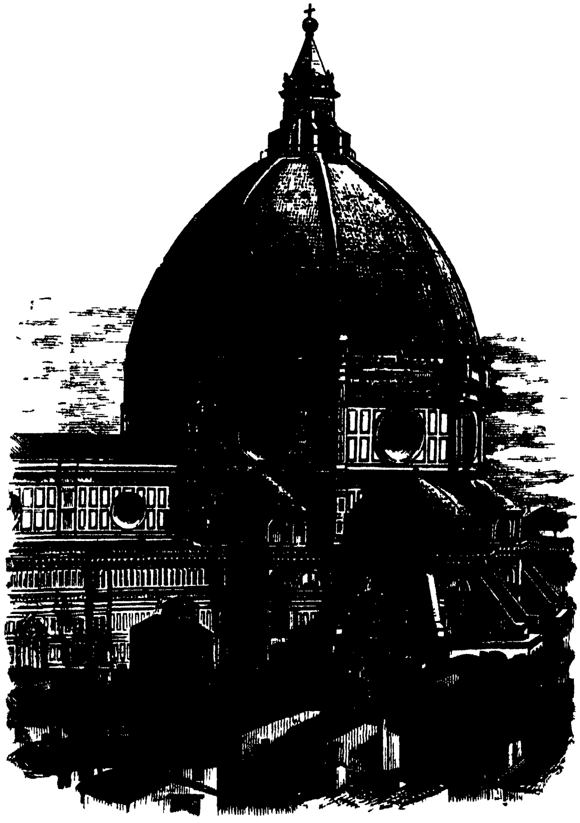


Fig. 42.—Brunelleschi's Dome at Florence.

With the exception of a dome at the intersection of nave and transept, the Italian architects introduced no fresh arrangement in their churches, and all their ingenuity seems to have been turned in the direction of finding a new costume wherewith to dress the old lay figure.

Secular architecture fared better in the hands of Italian architects than ecclesiastical work. New combinations were required, vestibules and courtyards, stately staircases, and suites of rooms for receptions, on a far grander scale than had hitherto been conceived; and it is in these that we find the most interesting examples of the development of the new style.

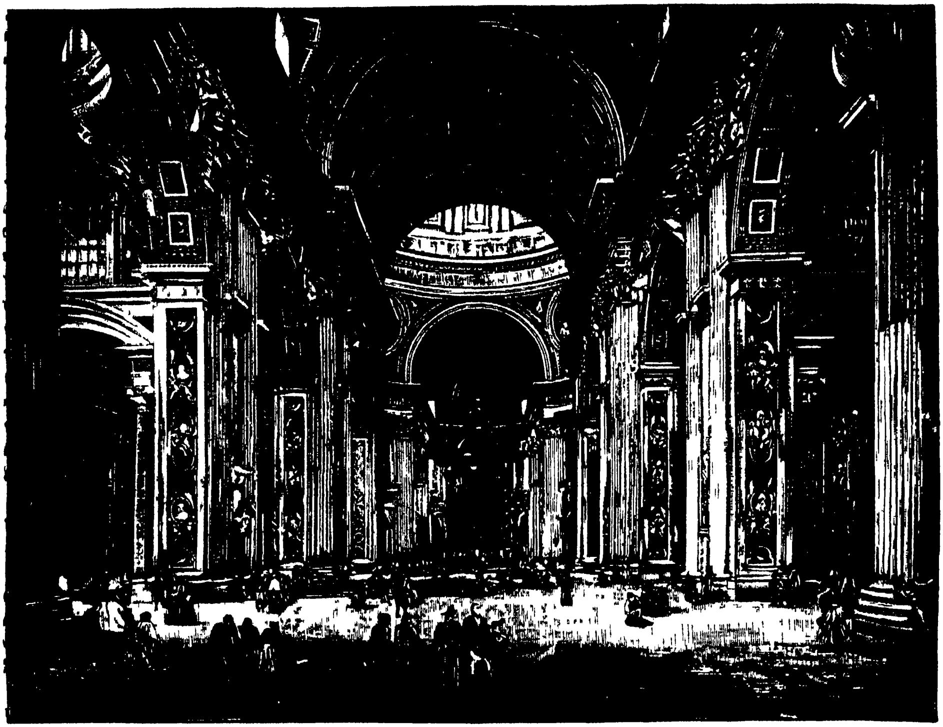


Fig. 43.—St Peter's, Rome.

The earliest palaces of this style were those of the Riccardi (1430), the Pitti (1435–50), and the Strozzi (1439), all in Florence; and the Piccolomini and Spanochi Palaces in Siena. These, so far as their exterior is concerned, are chiefly based on the early example of the Palazzo Vecchio, in which rusticated masonry is employed; the classic features appearing in the widely projecting cornices which crown them and in the interior courtyards. In the sixteenth century the decoration of the exterior is of two kinds: the several storeys have their wall-surfaces divided by pilasters of the orders superimposed one over the other, or the decoration is confined to rusticated masonry at the angles, and to the window designs, which are flanked with architraves or with pilasters, and crowned by angle or curved pediments. The Pandolfini Palace at Florence, attributed to Raphael, and the Farnese Palace at Rome are typical examples of the latter. The Cancellaria and the Belvidere Gallery of the Vatican, both in Rome and designed by Bramante, are good examples of the latter. To these may be added the Farnesina, the Massimi, the Ossola Palaces by Peruzzi, the villa of Pope Julius, and the palace of the Caprarola by Vignola, and the Tiene and Barbarino Palaces, and the great hall at Vicenza by Palladio. In all of these there is the same arrangement of superposition of pilasters of the several orders, one above the other, with a cornice crowned by an attic or balustrade and a flat roof. Michael Angelo introduced a new phase, carrying one great order through the storeys, which, while it gives a certain palatial aspect to the block, is opposed to common sense. An example of this is found in the Museum of the Capitol at Rome. Other variations are found in Genoa, where the marble vestibules and staircases are features of great beauty, the marble apparently being confined to these, as the fronts are invariably in stucco. It is to Venice again, therefore, that we turn for the finest examples of this style, and in the Cornaro Palace by Sansovino (who also erected the loggia at the base of the great campanile opposite St. Mark's), the Grimani Palace by San Michele (1548), the Balbi Palace by Vittore, and the Rezzonico and Pesaro Palaces (both dating from the middle of the seventeenth century and designed by Longhena) we have magnificent specimens of Italian Renaissance.

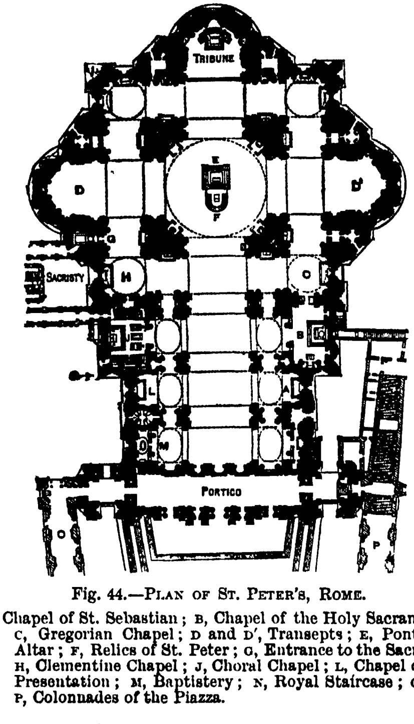


Fig. 44.—Plan of St. Peter's, Rome.

A, Chapel of St. Sebastian; B, Chapel of the Holy Sacrament; C, Gregorian Chapel; D and D', Transepts; E, Pontifical Altar; F, Relics of St. Peter; G, Entrance to the Sacristy; H, Clementine Chapel; J, Choral Chapel; L, Chapel of the Presentation; M, Baptistery; N, Royal Staircase; O and P, Colonnades of the Piazza.

COMMERCIAL CORRESPONDENCE.—VIII.

[*Continued from p.* 13.]

FRENCH, GERMAN, AND ENGLISH.

44.—Letter on Failure of a Firm.

London, January 1st, 18—.

Messrs. Carlton & Co., Manchester.

Gentlemen,—Our last, which we beg to confirm, was dated the 15th ultimo.

You will, no doubt, have been already apprised by telegraph of the failure of the old-established firm of Bernard and Co., which took place to-day.

Although the position of this house has for some time been considered precarious, in consequence of the difficulties in which the ——— Branch has been involved since the outbreak of the war with ———, where they did their chief business, it was hoped that with the assistance of some friends, and the arrangements proposed by the creditors, the present crisis might have been avoided.

Unfortunately, Messrs. Bernard and Co. received last night the sad news that the ——— bankers refused to make any further advances on bills drawn on ———; which circumstance prevented the ——— Branch raising the funds which they had to remit to the London house for the payment of their drafts. In consequence, the latter were compelled to suspend payment.

There is nothing known yet with regard to the exact position of the house; some expect a dividend of 10s. in the pound; others say there will not be more than 5s. or 5s. 6d. at the utmost.

As the assets chiefly consist of debts in ———. which in the present state of affairs are not easily collected, we think it rather difficult to make a correct estimate of what the dividend will be, but it will probably be between 5s. and 12s. 6d. in the pound.

Unfortunately, we are interested in this failure for some thousands, which very likely will also be the case with you, but, we hope, not to the same extent.

As soon as we are in possession of further particulars about this sad affair, we shall transmit them to you. Meanwhile,

We remain, Gentlemen, yours truly,
A. Dobson & Co.

Londres, le 1er *janvier*, 18—.

Messieurs Carlton & Cie, à Manchester.

Messieurs,—Notre dernière lettre, que nous vous confirmons, était du 15 du mois dernier.

Vous avez sans doute déjà appris par télégraphe la faillite, qui a eu lieu aujourd'hui, de la vieille maison Bernard et Cie.

Quoiqu'on considérât la position de la dite maison comme précaire, déjà depuis quelque temps, par suite des difficultés où la Succursale de ——— se trouvait depuis le commencement de la guerre avec ———, avec qui elle faisait ses principales affaires, on espérait pouvoir éviter cette crise par l'assistance de quelques amis et les arrangements que les créanciers avaient proposés.

Malheureusement, Messieurs Bernard et Cie ont reçu hier soir la triste nouvelle que leurs banquiers de ——— avaient refusé de faire de nouvelles avances sur des traites tirées sur ———, ce qui a empêché leur Succursale ——— de se procurer les fonds qu'elle avait à remettre à la maison de Londres pour le paiement de ses traites. Par suite de cette circonstance cette dernière s'est vue dans la nécessité de suspendre ses paiements.

On ne sait encore rien sur la position exacte de la maison; les uns s'attendent à un dividende de 10s.

par livre, d'autres disent qu'il n'y aura que 5s. ou 5s. 6d. tout au plus.

Comme les crédits faits en ——— composent principalement l'actif, et qu'en l'état actuel des affaires la rentrée sera très-difficile, nous ne croyons pas que l'on puisse dire à peu près quel sera le dividende, mais on espère que ce sera de 5s. à 12s. 6d. la livre.

Nous sommes malheureusement intéressés dans cette faillite pour quelques mille livres; très-probablement que vous êtes dans le même cas, du moins nous l'espérons pour un montant moins fort.

Aussitôt que nous aurons plus de détails sur cette triste affaire, nous vous en ferons part. En attendant,

Nous vous présentons, Messieurs,
Nos cordiales salutations,
A. DOBSON & CIE.

London, 1. Januar, 18—.

Herren Carlton & Co., Mancheſter.

Wir beſtätigen unſer Ergebenes vom 15. ulto.

Sie werden ohne Zweifel bereits durch den Telegraphen von dem heute eingetretenen Falliſſement der alten Firma Bernard und Co. informirt ſein.

Obgleich die Lage dieſes Hauſes ſeit einiger Zeit für zweifelhaft gehalten wurde, in Folge der Schwierigkeiten in welche die ——— Filiale durch den Ausbruch des Krieges in ——— verwickelt war—woſelbſt ſie ihr Hauptgeſchäft machte—ſo hoffte man die gegenwärtige Criſe mit der Hülfe von einigen Freunden und den von den Creditoren vorgeſchlagenen Arrangements vermeiden zu können.

Unglücklicherweiſe empfingen die Herren Bernard & Co. geſtern Abend die traurige Nachricht daß die ——— Bankhäuſer weitere Vorſchüße gegen auf ——— gezogene Tratten verweigerten, welcher Umſtand die ——— Filiale verhinderte, die Gelder aufzutreiben, deren ſie zum Remittiren an die Londoner Firma in Zahlung ihrer Tratten bedurfte. Letztere war in Folge deſſen genöthigt, ihre Zahlungen einzuſtellen.

Über die actuelle Lage des Hauſes iſt noch nichts Poſitives bekannt: einige erwarten eine Dividende von 10s. per Pfund Sterling, andere behaupten es würde höchſtens 5s. oder 5s. 6d. herauskommen.

Da die Activen hauptſächlich aus ——— Schulden beſtehen, welche bei der jetzigen Situation nicht leicht einzuziehen ſind, ſo halten wir es für ziemlich ſchwer eine correcte Schätzung der zu erwartenden Dividende zu machen, doch wird dieſelbe wahrſcheinlich zwiſchen 5s. und 12s. 6d. per Pfund Sterling betragen.

Unglücklicherweiſe ſind wir in dieſem Falliment mit einigen Tauſenden intereſſirt, was bei Ihnen wohl auch der Fall ſein dürfte, wenn auch hoffentlich nicht bis zu dem gleichen Belang.

Sobald wir im Beſitze weiterer Details über dieſe traurige Sache ſind, werden wir Ihnen dieſelben übermitteln. Bis dahin verbleiben wir,

Hochachtungsvoll,
A. Dobſon & Co.

45.—LETTER WITH ACCOUNT CURRENT.

Paris, January, 1891.

Messrs. Walker & Marshall, Leeds.

Gentlemen,—As we are closing our books for the past year, we beg to hand you an extract of your account current, showing a balance in your favour of £2,822 5s. 6d. to the 31st December, 1890, which we carry forward.

Believe us, Gentlemen, yours truly,
A. LELEUX & CO.

Paris, janvier, 1891.

Messieurs Walker & Marshall, à Leeds.

Messieurs,—Occupés du règlement de nos livres pour l'année qui vient de s'écouler, nous avons l'avantage de vous remettre le relevé de votre compte courant, présentant un solde en votre faveur de £2,822 5s. 6d. au 31 décembre, 1890, que nous reportons à nouveau.

Recevez, Messieurs, nos salutations cordiales,
A. LELEUX & CIE.

Paris, Januar, 1891.

Herren Walker & Marſchall, Leeds.

Mit dem Abſchluß unſerer Bucher für das vergangene Jahr beſchäftigt, behändigen wir Ihnen hiermit einen Auszug Ihres Conto-Corrents mit einem Saldo zu Ihren Gunſten von £2822 : 5 : 6 per 31. December, 1890, welchen wir vortragen.

Hochachtungsvoll,
A. Leleux & Co.

46.—REPLY TO PRECEDING LETTER.

Leeds, February, 1891.

Messrs. Leleux & Co., Paris.

Gentlemen,—Your favour of . . . ult. is duly to hand, covering extract of our account current with you, which we find correct.

We have carried forward the balance in our favour of £2,822 5s. 6d. to the 31st December, 1890, in conformity.

We are, Gentlemen, yours faithfully,
WALKER & MARSHALL.

Leeds, février, 1891.

Messieurs Leleux & Cie, à Paris.

Messieurs,—Votre honorée du . . . nous est bien parvenue, couvrant le relevé de notre compte courant chez vous, que nous avons trouvé correct.

Le solde en notre faveur de £2,822 5s. 6d. a été porté à compte nouveau, valeur au 31 décembre, 1890.

Nous vous saluons, Messieurs, avec empressement,
WALKER & MARSHALL.

Leeds, Februar, 1891.

Ihr Geehrtes vom . . . iſt in unſerm Beſitz und haben wir den uns damit überſandten Rechnungsauszug richtig befunden.

Wir haben den Saldo von £2,822 5s. 6d. per 31. December, 1890, gleichlautend mit Ihnen vorgetragen.

Hochachtungsvoll,

Walker & Marshall.

47.—REPLY TO LETTER ASKING INFORMATION ABOUT A SWINDLER.

Liége, November 10th, 1891.

Messrs. Bianchi & Co., Geneva.

Gentlemen,—We beg to acknowledge the receipt of yours of the 2nd, for which we thank you. The Peter Orlandi whom you mention we have known for about the last three years. We always executed a small order of his for his Italian journey, and expected to be paid before executing the next, as we had none but extremely uncertain information concerning him. At his last journey but one, he had mentioned to his agent that in a short time he would be able to extend his operations, as, by means of his brother or some other person, he would have some £20,000 more capital, and that all his purchases would then be for ready money. Some time before his arrival, he wrote to say that the imminent outbreak of hostilities had brought him a number of orders, and that he would be at Liége in a few days with ample funds ; he ordered his agent to call upon several manufacturers to request them to have ready for him a large assortment, as he was enabled to pay for his last orders as well as the new purchases.

Following these instructions, the agent called, not only on the firms who knew him, but also on some where he had not been before. Finding out sellers, he took the wretched swindler, after his arrival, to the various firms, who, thinking they would be paid beforehand, pushed the sale. When the time for his departure arrived, he gave acceptances in proper order on well-known firms, to most of the vendors, who accepted them, intending to send them off at once to ascertain their real value. To the firms who knew him he said that, having bought more than he had intended, he should pay them immediately on his arrival at Genoa. The boxes containing his purchases were delivered and sent off, as people were far from suspecting that they were dealing with an experienced swindler. A few days after, the sad truth was learnt. Our town loses about 900,000 francs. We ourselves, like others, lured by the prospect of an immediate payment, lose about 27,000 francs.

Herewith we send you an acceptance which he has given us, and which is of no more value than the others ; we also give you our authority to proceed against the swindler, should he still be in your city, and remain, very truly yours,

DE PRETIS BROTHERS.

Liége, le 10 *novembre*, 1891.

Messieurs Bianchi et C^{ie}, à Genève.

Messieurs,—Nous avons reçu votre honorée du 2 courant, et vous en sommes reconnaissants. Le sieur Pierre Orlandi dont vous nous parlez nous est connu depuis environ trois ans. À chacun de ses voyages en Italie, nous lui avons toujours exécuté une petite commande, nous attendant d'en être soldé avant de donner suite à aucune autre, vu que nous n'avions eu que des renseignements très-incertains sur son compte. À son avant-dernier voyage, il avait confié à son représentant qu'il serait bientôt en mesure de pouvoir opérer plus largement, parce que, par l'entremise de son frère ou d'une autre personne, il aurait un capital de £20,000 de plus ajouté à son commerce, et qu'alors tous ses achats se feraient au comptant. Quelque temps avant son arrivée, il écrivit que la guerre imminente lui avait amené de nombreuses commandes, qu'en conséquence il serait à Liége dans quelques jours avec un portefeuille bien garni ; il ordonna à son représentant de voir plusieurs maisons et de les prier de lui préparer un grand assortiment, car il était à même de solder ses derniers achats et ses nouveaux.

Muni de ces avis, le représentant visita non-seulement les maisons qui le connaissaient, mais encore celles où il n'était pas encore allé. Il trouva des fabricants ; à l'arrivée du misérable escroc, il le conduisit dans les différentes maisons, qui pensant être payées au comptant, poussèrent à la vente. Au moment de partir, il donna des effets acceptés et parfaitement en règle sur des maisons connues, à la plupart des vendeurs, qui les reçurent, mais avec l'intention de les envoyer de suite pour en connaitre leur valeur réelle. Aux maisons qui le connaissaient, il leur dit qu'ayant acheté plus qu'il ne pensait, il leur ferait le versement de ses achats à son arrivée à Gênes. Les caisses contenant ses marchandises furent livrées et expédiées, car on était loin de soupçonner que l'on eût à faire à un habile chevalier d'industrie. Quelques jours après, on apprit la triste vérité. Notre place se trouve dans cette malheureuse affaire pour environ 900,000 francs. Quant à nous, trompés comme les autres par la perspective d'un paiement au comptant, nous perdons environ 27,000 francs.

Sous ce pli nous vous remettons une valeur qu'il nous a donnée, et qui ne vaut pas mieux que les autres ; nous vous envoyons aussi nos pouvoirs pour poursuivre cet escroc s'il se trouve encore dans votre ville.

Nous vous présentons, Messieurs,

nos salutations cordiales,

DE PRETIS FRÈRES.

Lüttich, 10. November, 1891.

Herren Bianchi & Co., Genua.

Wir empfingen dankend Ihr Geehrtes vom 2 curr. Den von Ihnen erwähnten Peter Orlandi haben wir ſeit circa drei Jahren gekannt. Wir pflegten eine kleine Order für ſeine italieniſche Reiſe auszuführen, und warteten deren Bezahlung vor Ausführung eines neuen Auftrages ab, da wir nur ſehr unſichere Informationen über Genannten erhielten. Bei ſeiner vorletzten Reiſe hatte er ſeinem Agenten gegenüber erwähnt, er würde ſeine Operationen in Kurzem ausdehnen können, da ſich ſein Capital mit Hülfe ſeines Bruders oder eines Anderen um etwa £20,000 vergrößern würde, wonach er alle ſeine Einkäufe gegen Caſſa zu machen beabſichtigte. Kurz vor ſeiner Ankunft ſchrieb er, daß der unmittelbar bevorſtehende Ausbruch von Feindſeligkeiten ihm eine Anzahl von Aufträgen verſchafft habe, und daß er in einigen Tagen mit genügenden Geldern in Lüttich eintreffen werde. Er trug ſeinem Agenten auf, verſchiedene Fabrikanten zu beſuchen und ſie zur Aufmachung eines großen Aſſortiments aufzufordern, da er ſowohl für ſeine letzten Aufträge als auch für ſeine neuen Einkäufe zu bezahlen im Stande ſein werde.

Dieſen Inſtructionen zu Folge beſuchte der Agent nicht nur die Häuſer die ihn kannten, ſondern auch einige bei denen er noch nicht vorgeſprochen hatte. Nachdem er Verkäufer gefunden, führte er den Schwindler nach ſeiner Ankunft zu den verſchiedenen Firmen, welche in Erwartung vorherzuerfolgender Zahlung den Verkauf pouſſirten. Bei ſeiner Abreiſe bezahlte er die Mehrzahl ſeiner Verkäufer vermittelſt Accepten von wohlbekannten Firmen. Erſtere nahmen dieſelben an, in der Abſicht, ſie ſofort zu begeben, um ihren reellen Werth feſtzuſtellen. Den mit ihm früher bekannten Firmen verſprach er Zahlung nach ſeiner Ankunft in Genua, unter dem Vorgeben, daß er mehr als beabſichtigt, gekauft habe. Die Kiſten mit den Waren wurden ausgeliefert und abgeſandt, da die Leute nicht ahnten, daß ſie es mit einem geriebenen Schwindler zu thun hatten. Einige Tagen ſpäter kam die traurige Wahrheit zum Vorſchein. Unſere Stadt verliert circa fs. 900,000. Wir ſelbſt, gleich anderen, die ſich durch die Ausſicht ſofortiger Zahlung verlocken ließen, verlieren gegen fs. 27,000.

Wir ſenden Ihnen einliegend ein von ihm erhaltenes Accept, welches nicht mehr werth iſt, als die anderen, und wir autoriſiren Sie gleichzeitig, gegen den Schwindler vorzugehen falls er noch in Ihrer Stadt weilen ſollte.

Hochachtungsvoll,

THE NATURE OF HEAT.

THE general idea of heat is that it is a something which gives the sensation of warmth. This is only partly true. A piece of iron when intensely cold, as in Arctic lands, appears to the touch quite hot. The sensation of heat, therefore, does not under all circumstances denote what we shall consider as heat in these lessons, and any definition of it, were we to frame one, would not have to depend wholly upon the sense of touch.

There are certain effects, however, that we see which are not false impressions—thus heat melts ice. An inquiry as to how this is done would take us a step further in our endeavours to find out the nature of heat. As a preliminary we ask:—Is this heat which melts ice a bodily something which is imparted to the ice, or is it simply a motion which has been communicated to the ultimate parts of the solid water so as to give them the rolling motion of fluidity?

THEORIES OF HEAT.

These questions represent two theories on the subject which have been held by different philosophers. According to the former of these, heat arises from a subtle imponderable substance called *caloric*, which surrounds the ultimate atoms of all substances, and is capable of passing from one body to another. This is known as the caloric theory, and was for a long time almost universally received. According to it, no new heat could be called into existence, the amount in the universe being constant, so that the only way of heating any substance was by transferring some of this caloric from some other substance which was charged with it.

Many of the ordinary phenomena could be very easily explained upon this theory, but the production of an almost unlimited amount of heat by friction could not be accounted for, since it was obvious that no heat could be evolved in this way that was not previously stored up in the substance. An extensive series of experiments on the question was conducted by Count Rumford, and led to the rejection by many of the caloric theory; and a celebrated experiment by Sir H. Davy fully supported these views.

When ice becomes melted, a large amount of heat disappears or becomes latent, as will be fully explained hereafter; the water, therefore, according to the caloric theory, must possess a much larger amount of caloric than the ice. Davy accordingly took two lumps of ice and rubbed them violently together, and in a short time found that a portion of the ice was liquefied by the friction. Now, as in this instance, the water contained a greater amount of heat than the ice, it is clear that there must have been an actual *production* of heat, and not merely the evolution of some which was previously latent.

These experiments, with many others which might be quoted, tend strongly to disprove the caloric theory, and to support the other or *dynamical* theory. According to this, heat is not a material substance, but a *motion of the ultimate particles* of which bodies are composed. In this way heat presents many analogies to light and sound, for it is supposed that just as sound is produced by the vibrations of the air, so heat results from the rapid vibration of the particles of any body, or, according to some, the vibrations of an imponderable fluid by which those particles are surrounded. In further support of this view, we find that motion is frequently converted into heat, and conversely, that heat may be changed into motion.

When a ball is allowed to fall from a height, it acquires in falling a considerable velocity. Let it now strike upon some hard substance, and it will immediately be brought to rest: its motion will not, however, be annihilated, as will be seen if we allow a ball to fall several times, and then carefully ascertain its temperature. We shall then find that the motion of the ball has been changed into a motion of its ultimate particles, which is manifested by its becoming warmer.

AN EFFECT OF HEAT.

Take a glass flask and fit it with a good cork, through which a piece of glass tubing has been passed (Fig. 1). Let the end of this glass tube dip into water under an inverted tumbler filled with water. Now heat the flask with a flame of some kind—candle or Bunsen-burner—and bubbles of air will begin to issue from the end of the tube and rise up into the tumbler, where the expelled air will be collected. We may suppose here that the heat imparted to the air in the flask gives the particles wider movements, that they require more room, which shows itself in expansion.

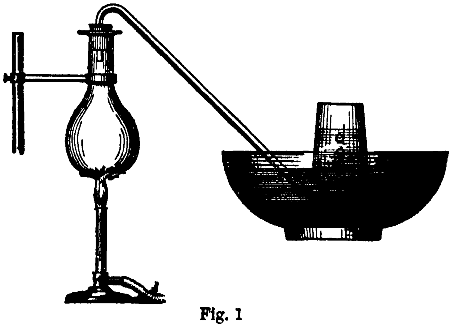


Fig. 1

TEMPERATURE.

The same phenomenon of expansion is seen in lesser degree in liquids when they are heated. Thus, mercury is seen to expand when it is heated in a glass bulb connected with a long narrow stem, and this constitutes one of the most familiar of instruments—the thermometer. The hotter the mercury is made the higher the silver-like thread rises in the narrow stem, conversely the colder the mercury becomes the lower the thread of metal descends towards the main body of it. If the thermometer be placed in succession in several different liquids, and they all bring the mercury to the same point in the stem of the thermometer, all these liquids are said to have the same *temperature;* if the liquids have not the same effect on the mercury, the one which brings the liquid metal to the highest point has the highest temperature, and the one which depresses it to the lowest point has the lowest temperature. We may regard temperature as a variable quality of matter, and its intensity we measure by the thermometer. This measurement is effected by means of a scale of degrees usually marked on the stem of the instrument. Thus with the Fahrenheit scale the freezing-point of water is put down as 32° and the boiling-point as 212°; the space between is divided into 180 divisions or degrees, and 32 similar divisions below the freezing-point we have the starting-point or zero (0°) of the scale. In the Centigrade instrument the zero or beginning of the scale is the freezing-point of water, and the boiling-point is put at 100°. In these lessons we shall denote the respective scales by the letters F. and C. in the usual way. A third scale of degrees is sometimes employed named the Réaumur scale, in which the freezing-point of water is 0°, and the boiling-point 80°.

QUANTITY OF HEAT.

Let us now for a moment consider *quantity.* A pound of water raised in temperature from 0° C. to 1° C. has a quantity of heat imparted to it which we might take as our unit quantity of heat. Three pounds of water raised 1° C. would have three times this quantity of heat given to it. When carbon is burned in oxygen, there is a brilliant light and a great amount of heat developed. The quantity of heat is definite in amount, 1 lb. of carbon giving rise to 8080 units of heat—*i.e.*, if we could utilise all the heat produced in burning 1 lb. of carbon, it would raise 8080 lb. of water through 1° C.

In passing we may say that the unit of weight usually employed is the kilogram (2¼ lb.), and the quantity of heat required to raise one kilogram of water 1° C. is called a *calorie.* Thus to take the foregoing example, the burning of 1 kilogram of carbon would yield 8080 calories. In the following table we have given the quantities of heat produced by burning a unit quantity of the substance in oxygen:—

Substance burned.	*Quantity of heat produced.*
Hydrogen	34,462
Carbon	8,080
Sulphur	2,220
Iron	1,570
Coal	8,000
Coke	7,000
Phosphorus	5,747

Though the numbers represent the amount of heat actually produced by combustion, it is but rarely that we can obtain and use anything like this amount, a large portion being always wasted. In the steam-engine, for instance, the work accomplished by any amount of fuel is seldom more than one-eighth of the theoretical amount, and often falls far short even of this. A large amount of heat is given off with the smoke in the chimney, and much is lost by being communicated to the machinery and given off by radiation.

In an ordinary fire-place, too, only a small fraction of the heat generated is serviceable in warming the room, the greater portion ascending the chimney, and being occupied in producing the upward draught. On this account many other modes of warming are more economical. The open fire, however, remains, and probably will remain, the most popular on account of its pleasant and comfortable appearance.

SOURCES OF HEAT.

The chief physical source of the heat which we enjoy is the sun, which, although situated at such an immense distance from us, nevertheless warms the earth by its rays. Of the source of the solar heat nothing is known, although many clever hypotheses, as well as many very foolish ones, have been started. So great is the amount of solar heat received by the earth that it has been calculated that it would be sufficient to melt in a year a layer of ice surrounding the globe to a thickness of thirty-eight yards. Other sources of heat we may consider under the following heads:—

1. *Terrestrial.*—As we dig down into the substance of the earth, we find that the temperature diminishes a little in summer till we attain a depth of about twenty yards. At this depth it remains constant all the year round, the summer heat and the winter frost being alike unable to penetrate; the temperature of this stratum is about 53° F. If now we sink still deeper, the temperature is found to increase at the rate of one degree Fahrenheit for every sixty or seventy feet, and this increase continues nearly uniform, whatever depth we attain. It is evident, therefore, that at a depth of a few miles the temperature must be very high; it is sometimes stated that at a depth of eight or ten miles this heat would be so great that nothing could resist it, and even the hardest rock would be fused. The melting-point of any body becomes, however, higher as the pressure on it is increased, and thus it is probable that the thickness of the crust of the earth is far greater than this. Many astronomical observations seem likewise to point to the same conclusion.

The air resting on the earth becomes warmed by contact with it, and by its radiation, so that as we ascend above the earth's surface the temperature gradually diminishes at the rate of about one degree Fahrenheit for every 300 feet of elevation.

Though we are mainly dependent on these physical sources for maintaining our temperature, there are mechanical and chemical sources of heat which are of great importance to us, and to which we must accordingly direct our attention.

2. *Frictional.*—The first of these sources of heat is *friction*, and the simplest experiment that can be tried, as illustrating the production of heat in this way, is to rub a metal button or the blade of a knife rapidly to and fro on a piece of wood. It will soon become so hot that it cannot be touched with any degree of comfort, and a piece of phosphorus may easily be inflamed by contact with it. The Indians are aware of the fact that heat may thus be evolved, and often obtain a fire by rubbing one piece of wood violently backwards and forwards upon another, or getting the friction with a drill. A little loose powder or dust soon accumulates in a groove on the lower piece, and the heat becomes sufficiently intense to set light to this (Fig. 2).

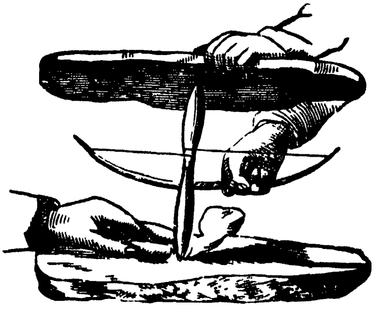


Fig 2.

The experiments of Count Rumford on this subject must be described here, as they were carefully arranged and conducted, and are very frequently referred to. He was engaged in superintending the boring of cannon in Munich, and in the course of this was struck with the great amount of heat evolved during the process. In order to determine the source of this heat, he constructed a metal cylinder weighing about a hundredweight, which was caused to rotate against a blunt steel borer. After the lapse of half an hour the temperature of the cylinder was found to have increased from 60° to 130° F., while the particles of metal worn off only weighed 837 grains. It was evident then that the heat which had elevated the heat of the heavy cylinder 70° could not have been evolved by a change of capacity for heat in this small quantity of metal.

In another experiment the cylinder was immersed in a vessel containing about two and a half gallons of water, and made to rotate against the blunt borer as before, and in the course of two hours and a half the water was caused to boil by the heat thus evolved. The supply of heat thus obtainable appeared indeed to be inexhaustible. The power which drove the cylinder was in this case converted into heat, just as when the brake is applied to a train the wheels are seen to smoke and give off sparks, owing to the motion of the train being converted into heat and thereby destroyed. We see now the reason why grease is applied to the axles of wheels and to pieces of machinery; if it be absent the friction is increased, and then a portion of the power is wasted by being converted into heat, instead of being employed to do the work of the machine.

In these experiments the quantity of heat produced has been so great as at once to be observed: very often, however, the amount is so small that it cannot be well shown, even by an ordinary thermometer. The mode, therefore, usually adopted in rendering its presence manifest is to use a thermo-electric pile.

If a bar of bismuth and one of antimony be joined end to end, and the point of junction heated, a faint current will pass between the ends of the bar and will deflect the needle of a galvanometer. When several such compound bars are employed, much greater sensitiveness is obtained. The bars are bent in the middle so that the alternate junctions may be at one side of the pile, as seen in Fig. 3. The ends are then connected, by the binding screws seen on the top in Fig. 3, with a delicate galvanometer, and we have thus a means of rendering visible the faintest amount of heat. So delicate, indeed, may this instrument be made that the warmth of the hand, when held at the distance of several feet, will visibly deflect the needle of the galvanometer. An instrument of this kind is of great service in all researches on heat; it is, in fact, almost indispensable, and hence frequent reference will be made to it in these lessons.

3. *Percussion and Compression.*—The next sources of heat which we must refer to are percussion and compression. An illustration of the production of heat by the former has already been given in the experiment of letting fall a leaden ball. A piece of soft iron, too, may be rendered red-hot by a few skilful blows on an anvil; and a blow or two with a hammer on an ordinary nail will at once raise its temperature sufficiently to affect the thermo-electric pile, and often to ignite a lucifer.

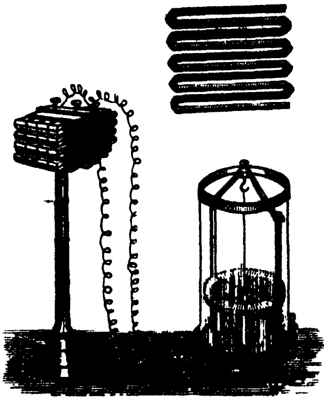


Fig. 3.

The best means of exhibiting the effects of compression is by the compression syringe represented in Fig. 4. A piece of stout glass or metal tube closed at one end, and having an internal diameter of about half an inch and a uniform bore, has a piston fitted tightly to it: in the under side of this piston is a small cavity in which a small fragment of tinder is placed. The tube is now placed against a wall or some support, and the piston quickly forced into it. So much heat is produced by the sudden compression of the air that the tinder is ignited, and when hastily drawn out will be found red-hot and smouldering.

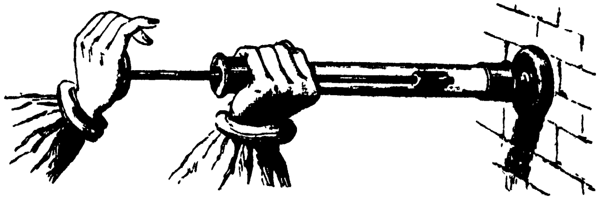


Fig. 4.

When a jet of hydrogen gas is allowed to strike upon very finely divided platinum, it sometimes renders it red-hot, and thus the gas becomes ignited. This may partly be attributed to condensation of the gas in the pores of the platinum, and partly also to chemical action. (*See* lessons on Light, Vol. VII., p. 119.)

This property of spongy platinum is sometimes turned to account in Dobereiner's lamp, which is shown in Fig. 5. It consists of two glass vessels, A and B, the neck of A reaching to the bottom of B. A piece of zinc (Z) is placed in the lower one, and diluted sulphuric acid is poured over it; the upper one is then fixed tightly in its place, the neck being ground so that it may fit air-tight The action of the acid on the zinc gives off hydrogen, which drives the liquid into the upper vessel, and thus leaves the zinc dry. As soon as the tap in the tube H is turned, the gas escapes, and coming into contact with the spongy platinum contained in D, is ignited. The acid then passes again into B, and a fresh supply of gas is generated.

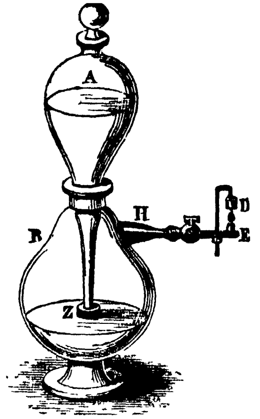


Fig. 5.

4. *Chemical.*—The next and perhaps the most important source of heat is chemical action. Nearly all chemical combinations are attended with the production of a greater or less degree of heat. If we take some sulphuric acid, and pour it into a vessel containing water, the heat thus evolved will at once be seen. When the act of combination goes on very rapidly, light is often produced as well as heat, and the term ***combustion*** is then commonly applied to the change. In reality, however, it is as much combustion when a piece of iron slowly rusts in the air as when iron wire is burnt in oxygen gas; and further, the same amount of heat is evolved during the whole process, whether the combination take a shorter or a longer time.

In most cases the substance consumed combines with the oxygen of the air. Heat, however, is produced by other combinations, as, for example, by that of hydrogen with chlorine.

If a little sulphuric acid be dropped upon a mixture of powdered sugar and chlorate of potash, the chemical action will be so intense that sufficient heat will be generated to inflame the mixture: this mode of producing heat is sometimes employed. The ordinary lucifer match is tipped at the end with a compound which is decomposed at a very low temperature. The friction of the match against the box is sufficient to raise it to this degree, and then the compound inflames and ignites the wood.

5. *Vital Action.*—Vital action is another source of heat, the temperature of the human body being above that of the surrounding air. This may, however, be regarded as a result of combustion, for a portion of the food taken into the system is really consumed, that is, its carbon unites with the oxygen of the air, and by this slow combination heat is produced which maintains the temperature of the body.

6. *Electrical.*—The only other source of heat which we shall refer to now is electricity. We have seen already how in the thermo-electric pile heat is converted into electricity, and we find more fully in our lessons on Electricity how it may in turn be converted into heat. A simple illustration of this is seen if a piece of thin platinum wire be taken and made to form part of the circuit through which a powerful electric current is passing; the wire will very shortly become white-hot, and even be fused. It is in this way that cannon and torpedoes are fired by the agency of an electric current.

EXPANSION PRODUCED BY HEAT.

We have now to notice the principal effects which heat produces on different bodies submitted to its influence. Take a rod, A (Fig. 6), of brass or copper, about half-an-inch in diameter, and cut a gauge of metal of the shape shown at B, so that the rod may just fit lengthways between the ends of the gauge, and also fit tightly in the hole, C. If now the rod be dipped in boiling water, or held over a source of heat so that its temperature may be raised, we shall find that it will no longer enter the gauge nor pass through the hole. It is clear, then, that the dimensions of the rod have been increased by its elevation of temperature, and we thus learn that one of the effects of heat is to produce expansion.

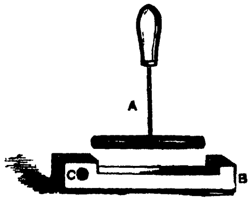


Fig. 6.

Take a flask (Fig. 7) and fill it with water slightly tinted with litmus, ink, or other colouring matter. Fix in it a tightly fitting cork through which a long glass tube has been passed; the water enters the tube and rises to a certain point, and here it will remain so long as the temperature is unaltered. Now warm the flask gently by means of a flame of some sort—candle or Bunsen burner—and note that the level of the water in the tube falls slightly, and then begins to rise. The temporary fall in the column of water is due to the expansion of the glass of the flask, which is first heated; but when the heat has reached the liquid it expands at a greater rate than the glass and the column of water then begins to rise. The evidence of expansion in the water is so apparent in this experiment that one may readily show it to a large class.

The expansion of metals is also so great that in large engineering works—as, for instance, long iron bridges—allowance has to be made for it, as otherwise the structure would be distorted and weakened. It is very important, therefore, to ascertain the exact amount of expansion which different substances undergo when their temperature is raised The simplest means of doing this is to take a rod of the metal, and having placed it so that one end presses against an adjusting screw and the other against the short end of a lever, heat it by means of a spirit lamp. The longer limb of the lever then serves as an index, and shows the amount of elongation Sufficient accuracy cannot, however, be obtained in this way, as the exact temperature of the bar cannot be determined The method devised by Lavoisier and Laplace is therefore frequently adopted

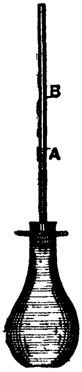


Fig. 7.

The following is the principle of the device A rod of metal, A B (Fig. 8), whose rate of expansion has to be ascertained is placed in a trough containing a liquid. The rod rests on glass rollers, and one end presses against the fixed upright rod of glass at F, while the other end is free. As the temperature of the liquid is raised, the rod A B lengthens out, and the end B approaches B′. B in its movement pushes against the arm B C of a right-angled lever, B C D, moving on a pivot at C, and the long arm C D is moved into the position C E by the time the rod has elongated to B′. The distance, D E, measured on an upright scale, bears a definite relation to the increase of length, B B′. Therefore, when D E is ascertained for a given rise of temperature, we have the means of finding out the amount of elongation B B′, and consequently the rate of expansion of the rod A B. For the long arm of the lever C D we may substitute a telescope to move on the pivot at C in the same way, and with which we may more conveniently ascertain the rate of expansion on the scale D E. The practical details of the method are as follow:—A metal trough (Fig. 9) is placed over a furnace between four stone supports, and the bar to be tested is placed in this. A rod of glass is placed between the supports at one end of the trough, so that the bar may press against it. On the top of the other two is a rod turning in bearings, and carrying at one end a telescope. Fixed to this rod is another at right angles to it, which presses against the other end of the bar under examination. An accurately divided scale is placed on the wall of the room opposite to the telescope, which has cross wires placed in it, so as to mark the centre of its field of view. It will easily be seen that when the rod elongates it will turn the axle which carries the telescope, so that by looking through the latter we shall be able to read off on the scale the amount of deviation, and by an easy calculation learn the exact increase in length. The visual ray here serves as a long index hand, and enables us to take our measures accurately.

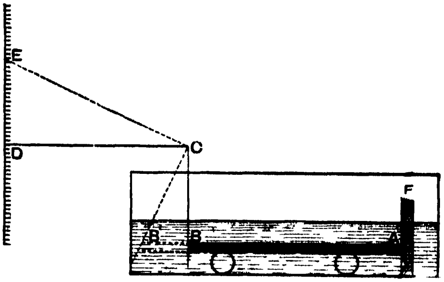
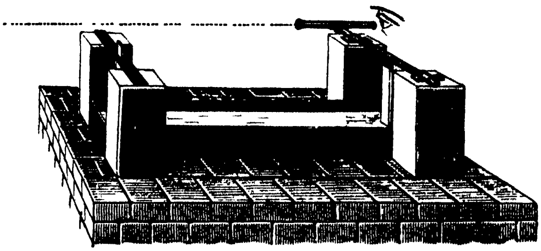


Fig. 8.

When an experiment is to be made, the bar is placed in position, and the trough filled with melting ice. In a little time it will have attained the temperature of 32° F., and an observation is then made through the telescope so as to determine the degree of the scale to which it points. The ice is now removed, and the trough filled with mercury or oil, and raised to the required temperature. When it has been stationary at this point for a short time,



·Fig. 9.

as shown by thermometers placed in the trough, a second observation is taken, and in this way the expansion is ascertained. This fraction is usually known as the coefficient of linear expansion, and in most tables it is given for the expansion between 32° and 212° F., or the freezing and boiling points of water. The following table shows the extent of this increase for a few common substances:—

Fir	$\frac{1}{2450}$
Flint Glass	$\frac{1}{1250}$
White Glass	$\frac{1}{1160}$
Platinum	$\frac{1}{1130}$
Steel	$\frac{1}{927}$
Cast Iron	$\frac{1}{901}$
Wrought Iron	$\frac{1}{846}$
Gold	$\frac{1}{682}$
Copper	$\frac{1}{580}$
Brass	$\frac{1}{530}$
Lead	$\frac{1}{351}$
Zinc	$\frac{1}{338}$

It must be remembered that this table merely indicates the linear increase—that is, the increase in one direction. Most substances, however, expand equally in each direction, and then the cubical expansion may be taken at three times the above fractions.

EXPLANATION OF THE EXPANSION OF BODIES.

The enlargement of bodies by heat is easily accounted for by the dynamical theory, for, when the particles vibrate more widely, they naturally endeavour to get farther apart, so as to have more space to move in. We may regard the particles of any body as being held together by two opposing forces—cohesion, which tends to draw them more closely together, and heat, which tends to drive them farther apart. If the heat be increased, the body expands a little by its influence, and then, as the particles get farther separated, it assumes the liquid state; and finally, in the case of many substances, the heat altogether overcomes the cohesion, and the particles fly apart in the form of vapour. When the source of heat is removed, and that already acquired by the substance has been imparted to surrounding objects, cohesion again comes into play, and the substance resumes the liquid or solid state.

POLITICAL ECONOMY.—VII.

[Continued from p. 21.]

EXCHANGE (*continued*).

Now it is clear that when payments are spread over a series of years, one of the parties may suffer very much from these fluctuations. If I take a piece of land now on a ninety-nine years' lease at a ground rent of £100, and gold goes up 20 per cent. in value during the next fifty years, I or my successor will then have to pay the equivalent value, not of £100 now, but of £120 now; that is, it will require (other things being equal) as much labour and abstinence to get that £100 as it now does to get £120. The purchasing power of coined money is found to vary little as regards commodities generally from one year to the next, but very greatly when we compare successive periods of years, or times 20, 30, 50, or 100 years apart. So it has been suggested that the standard for such payments should not be money. It has been found that while corn often varies greatly in value, comparing one year with the next, according as the harvest is good or bad, its average value, as determined by the average amount of labour and abstinence required to produce it, does not vary nearly so much as that of gold or silver. But a more stable standard it is thought might be found thus:—In the present year (for instance) a list might be made of the price of certain amounts of the necessaries of life—a bushel of corn, half a hundredweight of iron, a stone of meat, so many yards of cloth, and so on; the prices might be added up, the amounts being probably fixed by the estimated consumption of an average man for a certain time, and the result might be called "one unit of value." Then deferred payments agreed upon this year might be expressed, not in money, but as so many "units of value, 1892." And it might be agreed that every year the sum payable shall be, not so much gold, but the equivalent of the commodities that were exchanged for so much gold in 1892. The reason for taking several commodities is that the effect of occasional fluctuations in one or more will thus be spread over the values of the whole. This system is called "the multiple or tabular standard of value," and for payments spread over a series of years, or deferred payments, as loans for long periods, is a fairer method than payment in money.

Few subjects are more complicated than that of the currency, and in an elementary work we can only touch on one or two of the leading points. We must now mention "Gresham's law," or the proposition stated by Sir Thomas Gresham when Master of the Mint in Queen Elizabeth's reign, that "bad money will drive out good, but good will not drive out bad." That is to say, supposing new sovereigns are put into circulation along with old, worn, and therefore light sovereigns, the old ones will remain in circulation, the new ones will disappear. At first sight this seems strange. But it is clear that if a sovereign containing gold equivalent to 19s. 6d. will buy the same amount of goods as one containing the full amount of gold required—and unless the coin is carefully weighed it may be impossible to tell its real value—the interest of the holder is to spend the light one, and get rid of the heavy one to be melted down as bullion. And, in fact, this generally happens. The heavy pieces are picked out by jewellers, bullion dealers, and others, and sold as bullion; the light ones remain. But though one does not ordinarily weigh coins, yet banks and people who deal with large amounts do so, and thus the last holder may suffer heavy loss. Hence, when new coins are issued, it is desirable to call in the old. Hence, too, when paper money is issued, the gold it replaces soon tends to disappear: it is either melted down for use by jewellers, etc., or, much more generally, sent abroad, because the paper money of one country is not usually taken freely in others at its nominal or "face" value.

The English sovereign, we may note in passing, weighs in theory 123·27447 grains of "English standard gold," which is eleven parts fine gold and one part alloy, chiefly copper. As such minute accuracy is impossible in practice, a minimum weight of 122·50 grains is fixed, below which the sovereign is not legal tender. The limits between which the weight of the sovereign when issued must lie are 123·074 and 123·474 grains. But sovereigns weighing considerably less than the legal minimum are in circulation (we take these details from Jevons' "Money." The "Mint price of gold" is £3 17s. 10½d. per oz. troy; this, however, is only a way of saying that an ounce of gold is coined into three sovereigns and that fraction which is expressed by 17s. 10½d. For "price" means value estimated in standard gold coin; and the "value of so much gold estimated in standard gold coin" only means, since there is no charge for coinage, the amount of coin that is made out of that amount of gold.

A shilling contains less than three-fourths of a shilling's worth of silver, a penny only about a farthing's worth of bronze (Jevons). But as these are only "token coins," no harm is done.

It is a principle of monetary regulation that there shall always be free coinage of the standard metal—that is, anyone who has gold bullion in England has a right to take it to the Mint and have it made into sovereigns. Thus the amount of money expands with the demand for it more readily than it would if the consent of the Government had to be waited for. In England there is also gratuitous coinage, *i.e.*, there is no deduction (called seigniorage) made for the expenses of coinage. Sometimes this seigniorage has been considerably in excess of the expenses of coinage, so as to be a source of revenue to the State. This usually involves reduction of the purchasing power of the coin, and unsettles all commerce. The general view among economists is that there should be no seigniorage whatever, because even the smallest will tend to hinder the supply of money from keeping pace with the demands of increased trade.

The amount of coin, and, indeed, of coin and paper, which different countries use varies enormously, and seems to bear no defined relation to their wealth or commerce. England is a richer country than France, and has a much greater foreign trade; the rate of wages, too, and the general standard of living among all classes are higher, and there are many more rich people in England. Yet it is estimated that (about 1885) the United Kingdom had £3 10s. of gold in circulation per inhabitant, and about £5 6s. of gold, silver, and paper; while France had about £5 gold per inhabitant, and £10 10s. gold, silver, and paper. The amount required depends partly on the number of commercial transactions, partly on the extent to which banking facilities are developed; thus upwards of 99 per cent. of the sums paid in the wholesale trade in England are paid by cheques or bills of exchange, or other substitutes for cash. In no other country is banking developed to anything like the same extent.

BIMETALLISM. — It is clear that countries of different degrees of wealth must use different standard metals. Thus in England it would be very inconvenient if there were no gold coinage. But in some of the South American states wages are about 2s. a day, food is cheap, and there are few rich people, so that gold coins would have to be inconveniently small if they were to circulate generally. In India and China, where wages are only a few pence a day, the great mass of the people would never see gold coin at all; it could not be made small enough to suit their needs. Now when a merchant in a country with a gold standard trades with a merchant in a country with a silver standard, the terms of their bargain are affected not only by various unavoidable circumstances producing an unexpected rise or fall in the prices of the goods, but by the additional uncertainty whether silver is going to rise or fall, relatively to gold. Of late years silver has fluctuated much in value, and the profits made on each single transaction in modern trade are so small that a very slight variation may make a loss instead of a profit; and these uncertainties discourage trade. Or again, a railway in Mexico, built with English capital, may fix its fares and rates on the supposition that silver is to gold as

20 to 1; but the relation varies slightly from week to week, and every time silver falls in value the shareholders lose something, and the fear of this loss discourages investment of capital in the silver-using countries, which generally want it most. Besides, while there is not much prospect of large additional supplies of gold, there is ample prospect of a great increase in the supply of silver; but with the increase of trade and commerce there is more demand for standard money, and if this cannot be met prices will fall, and all payments, especially deferred payments, will represent a greater amount of sacrifice on the part of the payer than they would if prices had remained the same. Bimetallists, therefore, propose that the principal countries of the world shall agree that gold and silver shall be legal tender indifferently, the rate between them being fixed by law, and "free coinage" of both shall be established. It is objected that the actual ratio may vary again; and if so, it would be to the interest of those who have large payments to make to buy up the cheaper metal, get it coined, and make their payments in it. So the creditor would really be defrauded. "But," it is answered, "directly there is this run on the cheaper metal, it will become dearer again, and so the equilibrium will be restored." The difficulty here seems to be that the possible increase in the supply of silver is so large that it may constantly be getting cheaper with every attempt to supply such additional demand. But the question is beset with numerous difficulties far beyond the scope of an elementary work.

PAPER CURRENCY has arisen from motives of convenience. To keep large quantities of gold or silver stored, one must be well (and expensively) protected against robbers: to carry about the amount required for large payments would require horses and carts and porters. So a custom arose of transferring the bankers' receipts for it—just as people now who sell cargoes of goods transfer from hand to hand the dock warrants which entitle the owners to claim the cargoes. And it is great waste to use an expensive metal like gold when we can use paper instead. But when can we use paper instead?

For paper money to maintain its value, there must be absolute security that it can be converted into coin on demand. This is effected in most countries by prescribing a certain reserve which the banks that issue notes are compelled to keep, and limiting their issue to a certain amount. This in England is done by the Bank Charter Act of 1842. This (1) limits the note circulation of all banks which were issuing notes at the time of its passage to their average issue at that time; and, as it happened that no London banks but the Bank of England and very few joint-stock banks were then issuing notes, the privilege of note issue in England is now enjoyed only by a few private bankers in the country, and by the Bank of England. As it has been legally decided that this privilege cannot be transferred, and as the notes of private banks are not legal tender in England, it will most likely die out eventually. (2) The notes of the Bank of England are legal tender. The Bank is allowed to have £14,000,000 of them in circulation at any one time without any stipulations as to the amount of coin it must hold. But for every note over £14,000,000 (with certain exceptions we need not here state) there must be an equivalent of gold in the Bank. Thus it does not pay the Bank to have more than £14,000,000 worth of notes out. Up to that amount it has the use of the coin which is paid into it in exchange for the notes, or which it would have to pay out to its creditors were they not in existence. It is known by experience about how many notes are likely to be presented for payment in gold in a given time, and enough is kept to meet these demands. The rest is invested in various ways—the simplest to explain being that it is sometimes lent to foreign banks and Governments who use it as a reserve against note issue. The Bank, of course, gets interest on it, and so secures a revenue from wealth which, but for the privilege of note issue, would otherwise be lying idle. But on every note issued over the limit there would be the loss of just the amount of revenue which might be derived from the use of the coin which has to be kept in reserve to meet it.

The object of this Act is apparently to guard against the danger of "inflation." If a bank can issue as many notes as it likes, it will probably, it is thought, lend them freely to speculators. Notes will then be issued in excess of what the country wants, and will constantly be returned to the bank for payment in coin. The bank will find it difficult to procure coin enough to meet them; the suspicion that something is wrong will make everyone who holds notes try to get coin for them; and though banks may profess to pay every note on demand, it is quite clear that if they always kept enough coin to pay all their notes at once, there would be no profit in issuing notes. So the bank may break, and holders of its notes suffer heavy loss.

As a matter of fact, paper promises to pay which are nearly as good as the notes of many banks can be created so easily that it is doubtful if the Act really checks speculative lending at all. In special cases it may be suspended by the Government, *i.e.*, the Bank of England may be allowed temporarily to issue notes over the limit without having an equivalent in coin. We shall see why when we come to consider commercial crises.

In some countries the Government issues *inconvertible paper money*, that is, notes which profess to represent so much coin, but for which coin will not be given on demand. Often, however, the notes contain a promise that this coin will be paid for them after a certain date some years from their issue. This is, indeed, a favourite resort of Governments in difficulties, and were it absolutely certain that the notes would be paid as promised, and that the supply would not be allowed to exceed the needs of the country, it is just possible that these notes might maintain their nominal value. But nobody can say even approximately how much money the country does need at any time. It depends partly on the amount of trade, partly on the amount of separate payments, wholesale and retail, partly on the extent to which banking facilities are developed and people will take cheques and bills of exchange, etc., instead of notes or coin, and on other conditions. Nobody can measure the relative influence of these conditions at all. And if the Government has more expenses than were expected, it is only too easy to issue more notes, and hope that something may turn up to enable them to be paid some years hence. Now bank-notes are not usually employed in payments between country and country. Practically the arrangements of foreign trade we shall have to describe presently make international trade barter of goods for goods, and it is only when the values do not balance that money is sent to make up the difference. But this is coin and not bank-notes, because doubt about the solvency of a country is more free to find expression abroad than at home. Where, therefore, inconvertible notes and gold are both legal tender, the gold is a little more valuable in any case, because it can be used more freely for foreign payments, and in accordance with Gresham's law the worse money drives out the better. And, of course, the more of these notes that are issued, the lower their value is compared with gold. Gold then goes to a premium, and the fluctuations of this premium—almost always increased by speculation and affected by daily political events—make the real purchasing power of the notes quite uncertain, inflict the utmost hardship on their holders, and upset all monetary transactions. Thus, during the War of Secession in the United States, both sides being hard pressed for funds, issued inconvertible paper money. Gold at once went to a premium in both. In the North it reached 240—that is 240 dollars in paper were equivalent to 100 dollars in gold. As prices naturally could not follow all the fluctuations of the premium, and as it fluctuated from hour to hour—rising and falling during the progress of a battle as the telegrams were unfavourable or the reverse—no one quite knew what a sum of legal-tender money due the next day would really be worth when it came. In the Confederate States the value of the paper dollar fell steadily as the prospects of their success grew worse, until at last one heard of a pair of trousers selling for 1,100 dollars, a pound of sugar for 100, and so on. Eventually, the notes issued in the North were paid in specie, but the fluctuations meanwhile caused great loss to some and enormous profits to others. Under such a system the few clever people who understand the subject, and can see how things are likely to go, can make large fortunes at the expense of the great mass. Thus manufacturers on the Continent have been known to express pleasure at the issue of inconvertible paper, because their customers, large wholesale dealers, knew that the paper was worth less than gold, and so submitted to pay increased nominal prices, but their workmen did not find it out, and so contentedly took the same apparent wages as before. And, of course, the manufacturers pocketed the difference.

In dealing with paper substitutes for money, we have first mentioned bank-notes. We may next mention cheques, which are (as most people know) orders on a bank to pay a certain sum to a certain person, signed by someone who has money in that bank—that is, who is a creditor of the bank to at least the sum mentioned. These are transferable by endorsement, and might serve as substitutes for coin, though they do not usually do so in fact. A more important substitute is the bill of exchange. This is in the form of an order running usually somewhat as follows:—

> Three months after date pay to the order of John Jones the sum of One Hundred Pounds value received. THOMAS ROBINSON.
>
> To WILLIAM SMITH.

William Smith on receipt of this "accepts" the bill, *i.e.*, writes "Accepted," and the date of payment across it, and signs it. On the face of it, this document means that W. Smith owes T. Robinson a certain sum, and Robinson owes that sum to Jones; and that it is more convenient for Robinson to tell Smith to pay Jones than to pay Jones himself and collect his debt from Smith; and Smith by signing acknowledges the debt. But the sum actually paid by the bill is not £100 cash, but the sum that would produce interest enough to make it up to £100 cash if it were lent for three months.

These bills are largely used in commerce in the payment of debts at a distance, as in another country. They were often used, when usury laws were in force, to evade them. For nobody, except the parties, could tell what the original "value received" for the sum stated had been. They are transferable by endorsement, and if the names on them are those of persons of known credit, no difficulty is found in circulating them. Frequently they are used as means of raising money on the joint credit of the parties signing, and are then called accommodation bills; but with this use we are not here concerned They can always be converted into cash before they are due for payment. A sum is then deducted from the face value representing the interest that with the original sum would make up £100 at the date mentioned; something for commission, and something as insurance against the risk that the bill will not be paid—a sum which, of course, varies widely according to the business reputation of the people whose names are on the bill. Of the other influences affecting the rate of discount we shall speak shortly.

Between distant places or foreign countries the place of money is often supplied by "telegraph drafts" or "cable transfers"—which may be described as orders sent by telegraph to make payments which are balanced against orders sent the reverse way. Thus, if bank A, in London, telegraphs to its correspondent B in New York to pay £100 to Messrs. X, which a debtor of X, in London, has lodged with them, and B telegraphs to A to pay £110 to Messrs. Y, due to them from a debtor in New York, accounts between B and A can be settled up by B paying A £10. This sort of process, only infinitely more complicated, is going on always between every two commercial countries in the world, and by its means an immense economy is effected in the use of coin, and the risks attending its transmission are avoided.

APPLIED MECHANICS.—XV.

[*Continued from p. 27.*]

BENDING OR FLEXURE—STRENGTH AND STIFFNESS OF BEAMS—PRACTICAL RULES, ILLUSTRATIONS, AND EXAMPLES.

A LOADED beam is strained; and if we wish to have an illustration of the nature of the strain, we may use a material which yields readily like india-rubber. We can then study the phenomena of bending when manifested in an exaggerated form. Let the outline of two plane sections be drawn on the beam, at right angles to its length; when the beam is unstrained, these sections will then, of course, be parallel. When the beam is loaded, it will be seen that the sections approach nearer on the loaded or concave side of the beam, and are further apart on the convex side than before, the edge view showing two straight lines enclosing a trapezoidal, or wedge-shaped, portion. Fig. 92 represents a small portion of the beam in the two cases, the curvature in the second case being much exaggerated. We have in this a rough illustration of the fact or assumption on which all the laws of bending are based, viz., that *sections which were plane before bending remain plane after bending.* The theory founded on this assumption gives results agreeing exactly with experiment, and hence it may be taken as an established fact.

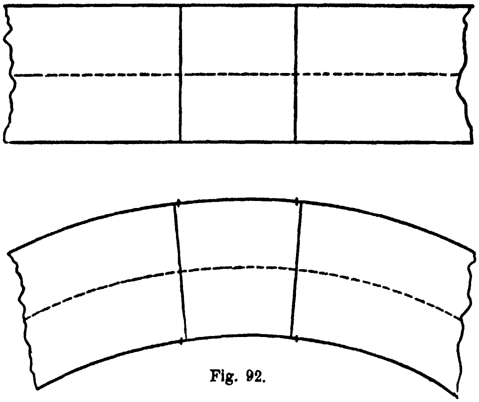


Fig. 92.

If plane sections remain plane, we see at once that the stress due to bending, near the concave or loaded side of a beam supported at the ends, is greatest at the surface, diminishing regularly towards the centre of the section, and again increasing towards the surface on the other side, the stress being in the first case compressive, and in the second case tensile. Fig. 93 illustrates this, $c\,d$ being the edge view of a section before, and $c'\,d'$ that of the same section after, bending takes place; the portion $a\,b\,d'\,c'$ being half the trapezoidal portion included between two sections which were parallel before bending. It will be seen that there is a surface or region somewhere near the middle of the beam where the fibres are neither extended nor compressed; this is called the *neutral surface*, and its elevation or section is the *neutral line.*

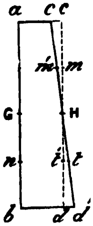


Fig. 93.

The *position* of this neutral line in any section is of some importance. This will be referred to later on.

We have referred only to compressive and tensile stresses due to bending; but in beams in actual use something more than pure bending occurs, which would be produced if the beam were acted on by equal and opposite couples at the two ends; in fact, there are *shearing* forces at a section; but in ordinary beams such as those used in building operations, the shearing forces are usually comparatively small.

All the laws of bending follow directly from the conditions of equilibrium for a number of forces *not* acting through one point. It may be well to state these conditions. They are—

(1) That the algebraic sum of the vertical components of all the forces shall be zero.

(2) That the algebraic sum of the horizontal components of all the forces shall be zero.

(3) That the algebraic sum of the moments of all the forces about any assigned point shall be zero.

The terms "horizontal component" and "vertical component" were explained at page 339 of Vol. V.

The first condition applied to a horizontal beam supported at the ends, and loaded (as beams usually are) with vertical loads, shows us that at any vertical section there is a resultant tangential force acting which balances the forces applied to the beam to *one* side of the section. In these forces we, of course, include a supporting force, which can be found as explained in an earlier lesson. This tangential force is the shearing force referred to above, and an illustration of its action can be obtained by the use of a model such as that shown in Fig. 94, in which the shearing force is represented by the pull in the cord M, due to the weight W′, which is equal to W together with the weight of the portion F M N of the beam. The model also shows the action of the tensile forces at A and the compressive forces at B, due to bending; the little prop at B, not being fastened in, would drop out if not acting as a strut, whilst the chain at A can *only* exert a pulling force. If the beam were supported at the ends and loaded in the usual way, the chain and prop would require to be interchanged.

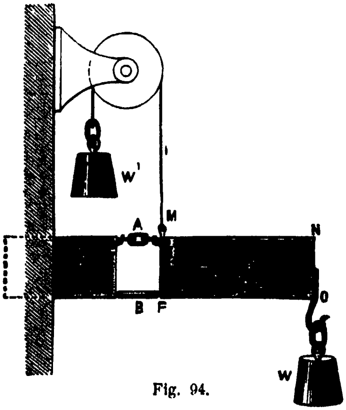


Fig. 94.

The second condition of equilibrium does not apply to *external* forces in the usual case, as the loads are vertical. If applied to *internal* forces, it gives us the *position of the neutral line in a section.*

Referring again to Fig. 93, we see that the strain (elongation below and compression above the neutral surface) is proportional to distance from the point H, or neutral line.

Let y be the distance of any assigned little area in the section from H; then our assumption about plane sections remaining plane leads at once to the conclusion that strain is proportional to y.

But by Hooke's law stress is proportional to strain; hence, stress is proportional to y, or is equal to $p\,y$, where p is the stress at unit distance from the neutral line.

Let a be the size of our little area, a being an exceedingly small fraction. Then, the force on a is stress $\times\, a = apy$, and our second condition, applied to the forces acting on all the little areas in the section, is that—

$$\Sigma apy = o,$$
$$\text{Or, } p\Sigma ay = o.$$

This condition can only be true if the *neutral line passes through the centre of area of the section.* The student will see that this is so if he consults the short reference to "centres of gravity" given at page 281, Vol. VI.

How, for instance, would the distance of the centre of any area from a given line be obtained? By multiplying each little portion of the area by its distance from that line, and dividing the sum of all these products by the whole area; in other words, the distance required is $\frac{\Sigma ay}{\Sigma a}$. But if $\Sigma ay = o$, the expression is o, and the distance vanishes, or the line from which we measure passes *itself* through the centre of the area.

Do not forget, then, the important result regarding the position of the neutral line in any section of a beam.

The third condition, applied to external forces to one side of the section and the internal forces which balance them, gives us the rule for the strength of a beam at any section.

The *bending moment*, represented by M_b, is the algebraic sum of the moments of all the external forces to one side of the section, taken about a point in the section, and it is balanced by the moments of the internal forces, or *moment of resistance.*

The force on any little area a is apy, and our third condition of equilibrium applied to the case shows us that if moments are taken about the neutral line,

$$\Sigma apy \times y = M_b,$$
$$\text{Or,}\quad p\Sigma ay^2 = M_b,$$
$$\text{Or,}\quad pI = M_b,$$

I being the moment of inertia of the section about the neutral line. This moment of inertia will be different from that used in questions on torsion, as the moment of inertia in the latter case is taken about a line through the centre of the section *at right angles to its plane.*

If p is the stress at unit distance from the neutral line, and f the stress at distance y from it,

$$py = f, \text{ or } \frac{f}{y} = p,$$

hence our rule for the strength of a beam becomes—

$$M_b = \frac{f}{y}I.$$

This important rule should be carefully remembered.

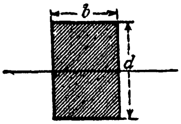
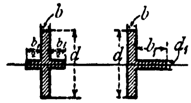
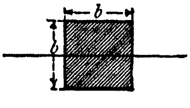
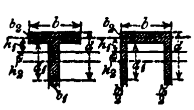
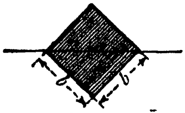
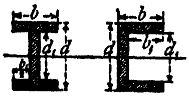
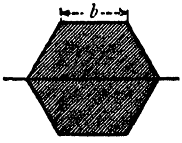
If we want the ***greatest*** bending moment a beam will stand at any given section, we must make f the greatest stress—of this kind—the material will stand, and y the greatest distance of any point in the section from the neutral line.

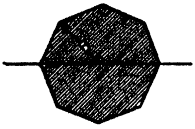
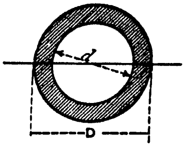
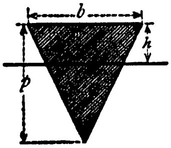
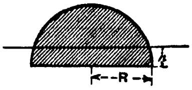
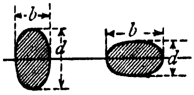
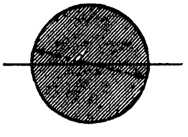
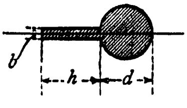
The strength rule is sometimes given in a slightly different shape. Thus, let $\frac{I}{y}$, the moment of inertia divided by the greatest distance y, be called the ***strength modulus*** of the section; then the greatest safe bending moment is obtained by *multiplying the greatest safe stress of the material by the strength modulus of the section.* It must be borne in mind that the stress f, here referred to, is not exactly the same as the ordinary tensile or compressive stress of the material; it must be found by experiments on bending.

The values of the moments of inertia and strength moduli of some common sections are given in Table I.

TABLE I.

Moments of Inertia and Strength Moduli of Sections.

Section.	Moment of Inertia about Axis shown through centre of Area.	Strength Modulus of Section.	Section.	Moment of Inertia about Axis shown through centre of Area.	Strength Modulus of Section.
 Rectangle.	$\frac{bd^3}{12}$	$\frac{bd^2}{6}$		$\frac{bd^3 + b_1d_1^3}{12}$	$\frac{bd^3 + b_1d_1^5}{6d}$
	$\frac{b^4}{12}$	$\frac{b^3}{6}$	 b₂ b b₂ b h₁ h₂ d h₁ h₂ d₁ b₁ b₁ Combinations of Rectangle.	$bb_2\left(\frac{b_2^2}{12} + h_1^2\right)$ $+ b_1d_1\left(\frac{d_1^2}{12} + h_2^2\right).$ $h_1 = \frac{b_1d_1(d_1 + b_2)}{2(bb_2 + b_1d_1)}.$ $h_1 + h_2 = \frac{d_1 + b_2}{2}.$	
 Square	$\frac{b^4}{12}$	$0{\cdot}118b^3$			
	$\frac{bd^3 - b_1d_1^3}{12}$	$\frac{bd^3 - b_1d_1^3}{6d}$	 Hexagon.	$0{\cdot}442b^4$	$0{\cdot}514b^3$

Section.	Moment of Inertia about Axis shown through centre of Area.	Strength Modulus of Section.	Section.	Moment of Inertia about Axis shown through centre of Area.	Strength Modulus of Section.
 Octagon.	$0\cdot638R^4$	$0\cdot69R^3$	 Circle.	$\frac{\pi}{64}(D^4 - d^4)$	$\frac{\pi}{32}\left(\frac{D^4 - d^4}{D}\right)$
 Triangle.	$\frac{bp^3}{36}$. $\left(h = \frac{p}{3}\right)$.	$\frac{bp^2}{24}$	 Semi-circle.	$0\cdot11R^4$ $\left(h = \frac{4}{3}\frac{R}{\pi} = 424R\right)$	$0\cdot191R^3$
			 Ellipse.	$\frac{\pi}{64}bd^3$	$\frac{\pi}{32}bd^2$
	$\frac{\pi d^4}{64}$. $\frac{\pi}{64} = \cdot0491$.	$\frac{\pi d^3}{32}$. $\left(\frac{\pi}{32} = \cdot0982\right)$		$\frac{\pi d^4}{64} + \frac{hb^3}{12}$	

For some simple shapes of section, such as the rectangular shape commonly used for timber beams, the strength rule may be put in a simpler form.

Our strength rule may not be true for loads exceeding the elastic strength of the beam, but if beams of different lengths, breadths, and thicknesses are tested up to breaking, all supported at the ends and loaded at the centre, it will be found that the breaking load w is proportional to the product of the breadth and the square of the depth, and inversely proportional to the length of the beam. Hence the rule may be written,

$$W = K \times \frac{bd^2}{l}.$$

where K is a number obtained by experiment.

If the beam is loaded and supported in any of the five other ways referred to in Table II., the method of loading and supporting must be taken into account, and the rule is therefore—

$$W = C \times K \times \frac{bd^2}{l}.$$

TABLE II.

Relative Strengths of Beams, supported and loaded as indicated.

Method of Loading and Supporting the Beam.	Greatest bending moment. Total load in each case = W, and length of beam = l.	Relative Strength. C.	Relative Deflection. D.
Fixed at one end and loaded at the other	Wl	·25	16
Fixed at one end and loaded uniformly all along its length	$\frac{Wl}{2}$	·5	6
Supported at both ends and loaded in the middle . .	$\frac{Wl}{4}$	1	1
Supported at both ends and loaded uniformly . . .	$\frac{Wl}{8}$	2	·625
Fixed at both ends and loaded at the middle	$\frac{Wl}{8}$	2	·25
Fixed at both ends and loaded uniformly	$\frac{Wl}{12}$	3	·125

In this, all dimensions must be taken in *inches* and loads in pounds.

The rule then is: the load which will break a beam of rectangular section, l inches long, b inches broad, and *d* inches deep, if loaded and supported in any of the six ways shown, is found *by multiplying the proper values of the constants* C *and* K *together, and multiplying their product by the breadth of the beam in inches, the square of its depth in inches, and dividing by the length of the free part of the beam in inches.*

Values of C are given in Table II., and values of K in Table III.

TABLE III.

Material.	Value of K.	Value of S (deflection) = $\frac{1}{4E}$.
English oak	6,680	$\frac{1}{7\text{ million}}$
,, **ash**	8,350	$\frac{1}{6{\cdot}4\text{ million}}$
Teak	9,180	$\frac{1}{9\text{ million}}$
Pitch pine	6,520	$\frac{1}{8{\cdot}4\text{ million}}$
Red pine	5,350	$\frac{1}{5{\cdot}84\text{ million}}$
Yellow pine	4,480	$\frac{1}{6{\cdot}4\text{ million}}$
Norway spruce	5,600	$\frac{1}{6{\cdot}4\text{ million}}$
Beech	6,220	$\frac{1}{5{\cdot}4\text{ million}}$
Elm	4,050	$\frac{1}{4\text{ million}}$
Mahogany	6,700	$\frac{1}{8{\cdot}5\text{ million}}$
Wrought iron	30,500	$\frac{1}{112\text{ million}}$
Cast iron	20,500	$\frac{1}{68\text{ million}}$
Cast brass	11,000	$\frac{1}{44\text{ million}}$

METEOROLOGY—I.

INTRODUCTORY REMARKS—THE ATMOSPHERE: ITS CONSTITUTION.

METEOROLOGY is the science of the atmosphere, of what Aristotle, the first systematic writer on the subject, called τὰ μετέωρα [*ta mĕtĕōra*], "the things above the earth." All our out-door pursuits depend so much upon the weather, the actual condition of the atmosphere at whatever spot we may be, that it is naturally a subject in which all are interested, and on which almost everyone, probably from the earliest times, has made observations more or less scientific, and has formulated opinions. The state of the clouds must have been observed as a weather prognostic from the very dawn of human intelligence, and dwellers in the country have other homely signs to go by. Animals are sensitive to coming changes of weather: sea-birds flying inland on the approach of storm, marsh-birds seeking higher ground, swallows and rooks flying low, frogs croaking, cows lying down, and sheep huddling together under hedgerows.

No scientific study of the atmosphere, however, was possible until the invention of such instruments for measuring its various characters as the thermometer and barometer, inventions which date mostly from the seventeenth century. The state of the air is affected by such a variety of local circumstances, such as altitude, proximity to the sea, aspect, soil, etc., that even long-continued and accurate observations at isolated spots tell us little about the general laws of atmospheric action, and will not enable us to predict anything of the weather for any length of time in advance. We are at the bottom of the atmospheric ocean, and from one spot can learn little more of it than an oyster could learn of the Atlantic. In modern times extended travel and widely scattered observers have facilitated such generalisations; whilst still more the electric telegraph, by enabling us to compare the changes in the atmosphere at almost every part of the earth's surface almost at once, has given us the power of predicting the rate and direction in which these changes are likely to be transmitted.

Humboldt's work on isothermal lines, published in 1817, was the first scientific treatise on meteorology, and Dove's great work on the distribution of heat on the surface of the globe, published in 1852, by raising up numerous observers in all parts of the world, was even more important in popularising the science.

Opinions are hardly agreed as to the leading subdivisions of the province of meteorology. It is sometimes divided into climatology, the science of weather and cosmical meteorology.

By *climate* is meant the local atmospheric conditions which determine the suitability of various districts for the support of vegetable and animal life. It is practically determined by the temperature and moisture of the air, and these in their turn by the prevailing winds, they deriving their temperature and moisture from the regions they have traversed. Thus, when in 1868 Dove first showed that the prevailing winds are simply the result of the relative distribution of the mass or pressure of the atmosphere, and that their direction and force are simply the flow of air from a region of higher towards one of lower pressure, or from where there is a surplus of air to where there is a deficiency, he furnished the key to the whole question of climate.

By *weather* is understood the state of the air at any time as respects heat, moisture, wind, rain, cloud, and electricity; and a change of weather implies a change in one or more of these conditions. Most of these changes also find their explanation in the distribution of atmospheric pressure.

Cosmical meteorology considers the physical conditions of the atmosphere, and their relations to light, heat, electricity, and magnetism.

As all meteorological phenomena are referable in the long run to the action of the sun, a second subdivision of the science has been proposed into the study of diurnal changes, *i.e.* those dependent on the earth's rotation, and that of annual phenomena, *i.e.* those dependent on its revolution.

In our lessons on Physical Geography (Vols. I. and II.) we have already dealt to some extent with the conditioning causes, the modes of observation, and the results of meteorology, especially in lessons III. and IV. (Vol. I., pp. 141-146 and 208-214) and in lesson IX. (Vol. II., pp. 164-167), so that we need not repeat what we have there said, these lessons being, as it were, supplementary to those in one special direction. After a few remarks, therefore, on the earth's movements, we shall pass on to the atmosphere and its composition, and shall then deal in succession with its temperature, pressure, movements, moisture, electrical and optical phenomena, treating under each of these heads of the instruments and other means by which the characters of the air are observed and measured, and of the geographical distribution of these phenomena.

The facts that the earth is only 90,436,000 miles distant from the sun on January 1st, whilst it is 93,564,000 miles distant on July 1st, that the earth consequently travels faster through the half of its orbit when it is in *perihelion* or nearer the sun than through the *aphelion* half, and that we in the northern hemisphere have our winter in the former or perihelion half of the orbit, cause the interval from the spring to the autumn equinox to be 184 days, whilst that from the autumn equinox to the spring equinox is only 181 days. Though, however, the sun is thus three days longer over the northern hemisphere than over the southern in its apparent motion round the earth, the resulting greater length of our northern summer is more than compensated for by the greater proximity of the earth to the sun during that of the other hemisphere, so that the southern summer is actually warmer than the northern.

The most important general or cosmical agency affecting meteorological conditions is undoubtedly the inclination of the earth's axis of rotation at an angle of 23° 27′ 44″ from the perpendicular. This gives us the seasons and divides the earth into zones as to light and heat. On June 21st, the longest day or summer solstice, the sun reaches his greatest northern *declination* of 23½° N., appearing vertically overhead at places 23½° of latitude north of the equator and remaining above the horizon in the latitude of London (51½° N.) for 16 hours 34 minutes. Then, as we have seen (*loc. cit.*), he turns southward and the days shorten till on September 22nd he stands over the equator, and we get the autumn equinox; and on December 22nd, the winter solstice, he attains his greatest southern declination of 23½° S., and we have our shortest day, one of 7 hours 47 minutes. Thus the length of the day is dependent upon latitude; and we have in this respect, and therefore in the total amount of light and heat from the sun received in each region, a natural division of the earth's surface into five zones. Within the Torrid Zone, *i.e.* for 23½° on either side of the equator, the length of the days is almost uniform throughout the year. In each Temperate Zone, 43° wide, *i.e.* between either Tropic and the Polar Circles in lat. 66½°, day and night vary considerably in length; whilst in the Frigid Zones, *i.e.* within the Arctic and Antarctic Circles, the sun during part of the year is more than twenty-four hours below the horizon, and at another season more than twenty-four hours above it.

The more nearly vertical are the sun's rays in falling upon the earth's surface, the more will their heating power be concentrated upon a limited area, and the less thickness of the dense lower strata of the atmosphere will they have to pass through.

There are, however, two causes, the combined action of which is to render the five latitudinal zones by no means regular zones of temperature. Firstly, the specific heat of water, *i.e.* the quantity of heat which it requires to raise its temperature 1° C., is much higher than that of land, whilst its power of radiating heat is far less; therefore the effect of the sun's rays upon water is communicated to the air above it far more slowly than is their effect upon land to the air above it. Secondly, nearly four-fifths of the earth's surface being covered by water, and this oceanic envelope being very irregularly distributed over the surface of the globe, though mainly over one hemisphere, it follows that the effect of the sun's rays will be very unequally transmitted to the atmosphere, quite independently of the five latitudinal zones. It must be remembered that the temperature of the air is more dependent upon this unequally radiated heat from the earth than upon the direct effect of solar heat (*see* Vol. I., p. 144); but this is a point to which we shall allude further.

Having thus far supplemented the lesson on the earth as a planet (Vol. I., pp. 62-65), as bearing on meteorology, we need add nothing to the description of the composition of the atmosphere given on pp. 141-142 in Vol. I., save the remark that, of all the varying ingredients of the mixture which we term air, the most important from a meteorological point of view, that is, as modifying temperature, pressure, and weather generally, is the water vapour. Dove described the whole atmosphere as a still, of which the sun is the furnace, the sea the boiler, the cool upper regions of the atmosphere and that of the temperate zones the condenser, whilst we, when it rains, catch the liquid distilling over. This water vapour is invariably present in natural air. It is in a great measure *athermanous*, or impervious to heat, and thus restricts both the direct access of solar heat to the earth, and the radiation of heat from the earth into space. Its variation in amount changes the weight or pressure of the air, and it is constantly passing, under changing conditions, from the vaporous to the liquid or solid state, or back again into vapour. Its measurement forms, therefore, one of the chief divisions of meteorology, which we shall deal with in a subsequent lesson.

LOGIC.—I.

INTRODUCTION—MENTAL OPERATIONS—TERMS—PROPOSITIONS.

MANY persons entertain a prejudice against the study of Logic, believing it to be either so difficult that it is beyond the reach of ordinary intellects, or else so useless as not to be worth any labour it would cost. From the tone and abstruse style of many even of the professedly elementary books upon the subject, this perhaps is hardly to be wondered at; but our aim in these lessons will be, by presenting a few of the broad outlines of Logic before our readers in as plain and simple terms as possible, and by pointing out the practical benefits to be derived, especially in self-education, from some acquaintance with its principles, to show the real groundlessness of such opinions; and by so doing to induce some of our readers to pursue the study for themselves, and so acquire an amount of intellectual training the possession of which they will always find valuable.

What, then, we must inquire at the outset, is Logic?—a question which, it must be admitted, is much easier to ask than to answer accurately and concisely. From the time of Aristotle, the earliest systematic writer upon logic, hardly any two persons have been quite agreed upon its definition or the mode in which it should be treated. Even to enumerate these definitions and views would be impossible, and we must be satisfied with trying to get a general idea, which may be popularly intelligible, of the subject and aim of Logic, as it is regarded in modern times.

Until comparatively lately Logic was treated of by most writers as the Art of Thinking, a conception too vague and wide to be capable of realisation. The late Archbishop Whately, who contributed at least as much as any other writer to restore Logic to the place which it should occupy in education, regarded it as the science and the art, not of thought or thinking in general, but of one only out of the many branches of thinking—of Reasoning. So far as it institutes an analysis of the process of the mind in reasoning he views it as a *science*, and so far as it furnishes practical rules, derived from those principles, for guarding against erroneous deductions, he views it as an *art*. One of the ablest thinkers of modern times, John Stuart Mill, defined it as "the science of all the operations of the understanding which are subservient to the estimation of evidence, or, more shortly, the science of evidence or proof." This view, it will be seen, embraces a much wider field than Archbishop Whately's. Without, however, critically examining these or any of the other numerous definitions of Logic, it will be sufficient for our present purpose if we understand that it aims at investigating the principles which every thinker observes (consciously or unconsciously) in reasoning, when he reasons soundly, and at deducing from them rules to guard against error or carelessness in the process of reasoning. So far as the former aim is concerned, we may regard it as a science; while, in reference to the latter aim, it may be considered as an art. A science treats of theoretical or speculative knowledge only, while art is the application of knowledge to practice; the study of a science *may* be nothing more than pleasant, the pursuit of an art *must* possess some practical utility.

It is generally laid down that the operations of the mind are three—Simple Apprehension, Judgment, and Reasoning. This is a statement the meaning of which we must clearly understand. It may, perhaps, seem strange to be told for the first time that it is possible to find any system or principle of classification amongst the different thoughts and ideas which are always passing, apparently at random, through our minds. It may seem that each idea and operation of the mind is so unlike every other that it must be impossible to group them into classes possessing any features of resemblance. Reflection and analysis, however, have proved the contrary; and the three divisions above given ultimately include them all. *Simple apprehension* is the operation by which the mind receives ideas. This it does through various channels—through sight, hearing, and touch, for example. But whatever may be the means through which the idea (using this word in its popular acceptation) is conveyed to the mind, the faculty or operation which the mind exercises in merely receiving it is called Simple Apprehension. When the mind has thus got ideas, it does not rest there; it compares them one with another, and determines whether they agree or disagree. For instance, having thus received or apprehended the ideas of *fire* and *heat*, it compares them, and pronounces that they agree; or the ideas of *iron* and *softness*, it compares these, and pronounces that they disagree. The result in each case is expressed in a judgment—in the one, "fire is hot," and in the other, "iron is not soft." *Judgment*, then, is the comparing together in the mind two of the ideas got by apprehension, and pronouncing that they agree or that they disagree with one another. A third process yet remains. A person after he has pronounced the judgment of agreement, "*that* is a fire," may join this (in a manner subsequently to be explained) with a previous judgment, "fire is hot," and conclude from the two combined "*that* is hot." When this is done, the mind has gone through a process of *reasoning*. So, too, in the other example given above, the reasoning faculty will have been exercised if, from joining the two judgments, "iron is not soft," and "*that* is soft," we conclude "*that* is not iron." *Reasoning*, then, may be defined to be the act of the mind in proceeding from certain judgments to a third founded upon them.

Language, even if not (as some think) the only means by which all these several operations of Apprehension, Judgment, and Reasoning can be carried on within the mind, is, at least, the means we are obliged to use in communicating them to others. We shall, therefore, consider the different ways in which the notions gained by these operations are expressed in language.

Briefly, an act of Apprehension is denoted by a *term;* an act of Judgment by a *proposition;* and an act of Reasoning, by an *argument* (called, as we shall subsequently see, when expressed in the particular manner required by the rules of Logic, a *syllogism*). Each of these must be examined separately.

A term (or name, as it is called by some) may consist of one word or of several, according to the sound or sounds used in each particular language to express the idea or object for which it stands. In our own language (as, indeed, in most others) the vast majority of terms consist of single words; and it is necessary to gain some insight into their import and classification before we can proceed farther with our study of Logic. This will be obvious, if we consider that the knowledge thus gained will enable us to understand the meaning and analysis of Propositions (which are expressed in words), and to guard against many errors and defects which otherwise might creep into our Reasoning (which we must also carry on through the instrumentality of words).

J. S. Mill defines a term as "a word (or set of words) serving the double purpose of a mark to recall to ourselves the likeness of a former thought, and a sign to make it known to others"; and it hardly seems requisite to expand this definition. A term is, however, explained, perhaps, more popularly by Archbishop Whately as "the view we take of an object." Terms have been divided into a number of classes, of which the following are the principal:—

(1) Into *singular* (or *individual*) and *common* (or *general*).—A singular term is one which is only capable of being truly affirmed in the same sense of *one* thing—*e.g.*, "Julius Cæsar," "City of London," "this stone." A common term, on the other hand, is one which is capable of being truly affirmed in the same sense of an *indefinite* number of things—*i.e.*, of all those which belong to the *class* for which the term stands—*e.g.*, "emperor," "city," "stone."

(2) Into *concrete* and *abstract*.—When a term stands for a thing it is called concrete; when for an *attribute* of a thing, abstract. Thus "wise," "black," "man," are of the former class, and "wisdom," "blackness," "humanity," of the latter.

(3) Into *positive*, *negative*, and *privative*.—A term is positive which denotes the presence of a certain attribute—*e.g.*, "patience," "man," "seeing," and one which denotes the absence of an attribute is called either negative or privative, according as the thing is considered as one which might be expected to possess the particular attribute or not. Thus "impatient," "not-man," are negative terms; but "blind" is privative, because, in addition to denoting the absence of the attribute "sight," it also implies that that is an attribute which the human being or animal to which the term may be applied might be expected to have had.

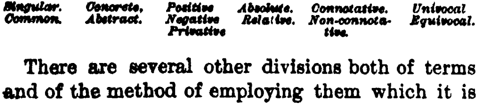
(4) Into *absolute* and *relative*.—A term is absolute which denotes an object considered by itself, without being viewed in relation to other objects. "Man," for instance, does not imply in its signification the existence of any other object than the one for which it stands. Hence it is called absolute. A relative term, on the other hand, denotes an object viewed in relation to some other object, which, in its turn, is viewed in relation to the first, and has a name given to it from the

relation between the two. Thus "father" and "son," "ruler" and "subject," "longer" and "shorter," are relatives; and each term in the different pairs is called the *correlative* of the other.

(5) Into *connotative* and *non-connotative.*—These words (which are derived from the Latin) mean "marking along with," and "not marking along with" respectively. The first name is applied to terms which, besides denoting an object, serve also to mark or imply some *attribute* of that object. Terms to which the latter name is given denote the object in the same manner as the former, but do not, like them, imply in their signification any attribute of the objects for which they stand. Thus "white," "virtuous," "capital of England," "Emperor of France," are all connotative terms, as in addition to serving to mark and stand for the particular things or people to which they are applied, they also *con*-note at the same time the attributes of "whiteness," "virtue," "being the capital of England," "being the Emperor of France," which belong to them. "Whiteness," "virtue," "London," "Napoleon," are, on the contrary, of the class of non-connotatives, as each denoting an object only, without serving also to mark any particular attribute thereof. It will appear, from what has been already said upon abstract and concrete terms, that all concrete common terms must belong to the former class, and all abstract common terms to the latter.

(6) Into *univocal* and *equivocal.* — Strictly speaking, these are not two kinds of terms, but two modes of employing them. A term is applied univocally with respect to all objects to which it can be applied *in the same sense.* It is applied equivocally with respect to all objects to which it can be applied *in different senses*—*e.g.*, "stone" is applied univocally when it is used of granite, limestone, sandstone, etc., but equivocally when it is applied to some one of these, and to a certain measure of weight.

By way of recapitulation in a tabular form, we may say, then, that terms may be classed as follows:—



There are several other divisions both of terms and of the method of employing them which it is unnecessary to enumerate here. Those given above are the principal, and will be sufficient to enable the reader to understand the remarks which follow.

We have next to consider *propositions.* A Proposition is, as has been already said, a "judgment expressed in words," or we may describe it as a sentence which pronounces that one of two objects or ideas agrees or disagrees with the other—*i.e.*, as a sentence which affirms or denies. Let us take a very simple proposition and analyse it—*e.g.*, "Man is an animal." Here, in the language of logicians, "man" is termed the *subject;* "an animal" the *predicate*, and "is" the *copula.* The Subject is in every instance that which is spoken about, that with which something is pronounced to agree or disagree, that of which something is affirmed or denied. The name of Predicate (a word derived from the Latin, and meaning "to assert") is given to that which is said of the subject, that which is pronounced to agree or disagree with it, that which is affirmed or denied of it. The Copula is the term which indicates the act of judgment, which pronounces whether the subject and predicate agree with one another or not. This must always be "is" or "is not"; and if the predicate and copula are combined together into one word, as in the proposition "the fire burns," it may be resolved into the copula and participle—*e.g.*, "the fire is burning." The substantive verb "to be," when thus employed as a copula, it may be remarked, does not necessarily include the idea of real existence—*e.g.*, "the centaur is a fictitious animal," in which sentence the copula joins together two terms, each of which stands for a non-existent object.

Propositions are divided into several classes, the first and most obvious division being into affirmative and negative. An *affirmative* proposition is one in which the predicate is affirmed of the subject, and a *negative* one in which the predicate is denied of the subject. Thus, "lead is heavy" is affirmative, "stones are not light," negative. This is called a division according to *quality.*

We may also divide propositions into *categorical* and *hypothetical.* The former of these simply assert that the predicate does or does not agree with the subject—*e.g.*, "man is mortal," "the Bible is not of human origin." The latter (to borrow the words of Archbishop Whately) make their assertion under a condition—*e.g.*, "if the world is not the work of chance, it must have had an intelligent maker"; or with an alternative—*e.g.*, "either mankind are capable of rising into civilisation unassisted, or the first beginning of civilisation must have come from above." The name of *conditional* is given to such a proposition as the first of these two last examples, and that of *disjunctive* to the second. There is also a further classification of categorical propositions. Some of them are called *pure*, such as those given above, which make the assertion of agreement or disagreement simply; while others, which have some adverb or qualifying word attached to the predicate, denoting the *manner* in which the subject and predicate agree or disagree, are called *modal.*

Propositions must also, unless they are absolutely unmeaning, be either *true* or *false;* but this is a matter which, to speak accurately, falls not within the province of Logic, but within that of the particular subject-matter about which the proposition makes some assertion. If it were to be considered otherwise, the logician, as such, would be required to possess an accurate and intimate acquaintance with every branch of human knowledge.

Besides this, Propositions are also divided into Universal, Particular, Indefinite, and Singular. A *universal* proposition is one in which the predicate is affirmed or denied of the *whole* of the subject—*i.e.*, of all the things denoted by it; and a *particular*, one in which the predicate is affirmed or denied of only a *part.* "All men are mortal" is an example of the one, "some men are vicious" of the other. Where, however, it is left undetermined by the mere *form of the sentence* whether it is the whole or only a part of the subject which is spoken of, as "man is mortal," the proposition is termed *indefinite.* A *singular* proposition is one in which the subject is the name of an individual, or a proper name—*e.g.*, "Garibaldi is a patriot." The division of propositions into universal and particular is one according to *quantity*, as it is termed; but before passing from it, there is one other observation which must be made.

The classification of Propositions given above may be shown in a tabular form thus:—

PROPOSITIONS.

- (1)
  - *Affirmative.*
  - *Negative.*
- (2)
  - *Categorical*
    - *Pure.*
    - *Modal.*
  - *Hypothetical*
    - *Conditional.*
    - *Disjunctive.*
- (3)
  - *True.*
  - *False.*
- (4)
  - *Universal.*
  - *Particular.*
  - *Indefinite.*
  - *Singular.*

A term is said to be *distributed* when it is taken in its whole extent—*i.e.*, when it is used to stand for *all* the objects which it can signify; and *undistributed*, if used only for a *part* of them. Hence from what has been said above, it will appear plain that the subject is distributed in all universal propositions, but never in singulars. In other words, the *quantity* of the proposition determines the distribution of the *subject.* The distribution, however, of the *predicate* depends upon a different consideration. This is regulated not by the quantity but by the *quality* of the proposition. A little reflection will make this clear. When we say "all men are mortal," what we are really doing is this—we are speaking of all the objects signified by the term "man," and affirming of them that they are mortal—*i.e.*, that they belong to the class of mortal objects. But in so doing we are not dealing at all with the rest of the class of mortal beings besides man—*e.g.*, birds and beasts; we are leaving them out of consideration altogether, and the proposition would be equally true whether or not there were any other mortal beings besides men. In other words, we are using the term mortal, the predicate of the proposition, in an undistributed sense; and this takes place in every affirmative proposition, whether universal or particular. In negatives, however, the case is otherwise. Let us take as an example, "no vice is useful." Here we are really speaking of the whole class of objects to which the term "useful" is applicable, and denying that "vice" can be found amongst any of them, that *any* part of the predicate agrees with the subject. Hence the predicate is always distributed in a negative proposition, for the simple reason that if any part of that for which the predicate stands were to agree with the subject, and not disagree with it, the proposition would not be true. The result may be thus summed up. (1) All universals (and no particulars) distribute the subject. (2) All negatives (and no affirmatives) distribute the predicate.

With reference to their quantity and quality, taken together, logicians are accustomed to denote every proposition by one of the four first vowels of the alphabet, as a symbol to represent it. Thus:—

Symbol.	*Proposition.*	*Example.*
A	Universal Affirmative,	"Every man is an animal."
E	Universal Negative	"No man is a stone."
I	Particular Affirmative,	"Some man is just."
O	Particular Negative,	"Some man is not just."

Having thus given some account of the most important classifications of propositions, it will be more convenient to say a few words upon another subject (which could not, perhaps, have been so readily understood at an earlier period), before proceeding to consider the different relations which propositions bear to one another.

We have already explained what is signified by universal terms; but the reader must also learn that these have, from the time of the earliest treatises upon Logic, been divided into five classes, called *predicables*, termed respectively "genus," "species," "difference," "property," and "accident."

A *genus* may be described as a universal term which contains under its signification that of two or more other universal terms. In this way "animal" is to be regarded as a genus, as comprehending under the idea for which it stands the ideas represented by the other universal terms "man," "beast," "bird," etc.

A *species* is a universal term which is contained under another more universal term—*e.g.*, "man" is a species of the genus "animal," as forming a part of what it comprehends.

It is to be noticed that the same term may often be regarded as genus or species, according as it is considered with reference to the terms which it contains, or those under which it is contained. Thus "man" is a species of the more universal term "animal," but a genus when regarded as containing under it the less universal terms or species "negro," "white man," "European," "American," etc. A genus which is so comprehensive as to be contained under no other is called the *highest* genus; and a species which, on the other hand, contains no species under it, but merely comprises individuals, is called the *lowest* species. All between these are known by the names of *subaltern* genera or species.

A *difference* is the name given to the attribute which distinguishes a particular species from all the other species which are included under the same genus. Thus "rational" is the difference which distinguishes the species "man" from the other species included under the genus "animal." And if we define "man" as a "rational animal," we have what is called a *logical definition*—*i.e.*, one made up of the genus and essential difference.

A *property* is the name of an attribute found in all the individuals of a species, and which, though not of the essence of the species, is necessarily joined to it—*e.g.*, "being influenced by motives" is a property of "man," necessarily following from his being "rational."

An *accident* is an attribute which, though not necessarily joined to the difference, is yet found in *some* of the individuals of the species. It may be *inseparable*—*i.e.*, found in all the individuals of the species, though not necessary to their existence as such—*e.g.*, "blackness" in *crows*; or *separable*—*i.e.*, not universally found in the species—*i.e.*, not amongst all the individuals, or not in the same individuals at all times—*e.g.*, "blackness" or "sleeping" in *men*.

BRITISH COMMERCE.—III.

[*Continued from p.* 40.]

RAW COTTON.

THOUGH the manufacturing of cotton fabrics is little more than a century old in this country, this industry has grown to such dimensions that in 1890 the value of the raw cotton imported amounted to £42,756,575, the quantity being 16,013,350 cwt. In 1790, just a hundred years previously, the quantity imported was only 267,857 cwt.

Of the total now arriving quite two-thirds come from the United States of America, the cotton-producing States being Alabama, Georgia, Louisiana, and South Carolina, and the principal ports whence it is shipped being Charleston, Mobile, New Orleans, and Savannah. It comes over in the form of rectangular bales, tightly pressed together by hydraulic power, the weight of the bales varying from 450 lb. to 560 lb. This compact form facilitates handling and saves stowage. The American cotton, besides coming over in the best form, is of the best quality, the fibres being long and strong—especially superior is that grown on the islands along the coast of Georgia. The cotton plant is cultivated in extensive fields, in which the seed is put into holes a considerable distance apart to give the plant room for development. In less than three months from the time of sowing the plants flower. Thereafter a capsule forms about the size of a walnut, and as soon as this begins to open, and before the wind can disperse its contents, the seeds, which are enveloped in down, are gathered and sent to mills to be separated from the down. The seeds are either kept for sowing or are used to make oil from. The down is the cotton, which is ultimately spun and woven into fabrics.

After America the chief source of our cotton supply is India, whence, including the Straits Settlements and Ceylon, we received in 1890 2,131,667 cwt., of the value of £4,742,352, the imports from the United States being 11,756,758 cwt., of the value of £31,395,055. A considerable impetus was given to the cultivation of cotton in India through the American Civil War of 1860. Our supplies of cotton from that country were, of course, stopped through the war, and we were obliged to look to India to make good the deficiency, with the result that our imports from that country grew from just over a million and three-quarters cwt. to five and a half million cwt. Indian cotton was then far inferior to American, the fibres being short and ill-adapted for our machinery, which was designed for the finer American long cotton. Yet the prices it commanded were of the highest. Even now, though it is largely grown from American seed, Indian cotton, taken all round, does not fetch the price of American. In commerce the several sorts of Indian cotton are known as Bengal, Bombay, Manilla, Madras, Siam, and Surat.

From Egypt come large consignments of superior cotton, the quantity in 1890 being 1,618,448 cwt., the value £5,316,936. It is grown from the seed of American cotton, hence its quality. Algeria also produces cotton of a high class. Other cotton-yielding countries are Brazil, Chili, the United-

States of Colombia, Guayana, New Granada, Peru, and the West India Islands.

The chief seats of the cotton industry in this country are Manchester, Bury, and Oldham, and out of the 16 million cwt. that we bring here 14¾ millions are landed at Liverpool. This, of course, is due to its proximity to the cotton-mills, and to its being our leading port for the American trade. The Manchester Ship Canal will doubtless rob it of its predominance as a cotton port.

JUTE.

The source of our jute supply is India. Of the total imported in 1890, viz., 369,958 tons, valued at £4,921,991, Bengal alone sent 369,151 tons, valued at £4,911,439. The centre of the jute manufacture is Dundee, and to that port consequently went 226,111 tons, London receiving only 124,203 tons, and Liverpool 16,772 tons.

The jute plant grows from 12 ft. to 14 ft. high, and the fibre which is contained in the bark runs to lengths of 8 ft. It is made into coarse canvas and gunny bags mostly, but on account of its fine lustre it is also mixed with silks to produce the cheaper sorts. It readily lends itself to adulteration, as it always improves the appearance of whatever fabric it may be woven into. It does so, however, at the expense of the durability of the fabric. Though it easily rots from moisture, and is therefore unsuited for articles much exposed to the weather, or in which the quality of strength is required, such as ropes, it yet finds its way into these articles, the temptation to improve the appearance of their fabrics and so impose upon the unwary being too great for some manufacturers to withstand. A genuine hemp rope, for instance, costing £32 a ton, would be cast aside by anyone not an expert for a rope made of jute and not worth half the money.

HEMP.

The chief uses that hemp is put to are the manufacture of sail-cloth, cordage, sacking, and fabrics requiring strength. A coarse brown paper is also made from it, and oakum (with which the inmates of our prisons make a reluctant acquaintance) is simply tarry hemp, got by untwisting worn-out ships' ropes. When teased out, it is again used in ships for stopping leaks and for caulking.

Our chief supplies of this fibre come from the Philippine Islands, whence in 1890 we imported 608,758 cwt., valued at £1,232,497. Other sources are Germany, from which came 225,135 cwt., at £286,076; Russia, 203,147 cwt., at £252,712; Italy, 193,708 cwt., at £329,937; and Mexico, 42,177 cwt., at £60,518. The total amounted to 1,767,551 cwt., worth £2,834,154. The Italian, the price of which will be observed to be comparatively high from the above figures, is raised by spade culture, and is of a high degree of excellence, being known as "Italian garden hemp." The ports that receive the largest consignments are London, 1,100,424 cwt.; Liverpool, 529,946 cwt.; Hull, 240,863 cwt.; and Leith 105,735 cwt.

The hemp plant is native to Persia and the northern parts of India. From these countries it has been introduced into Europe. It grows as high as ten feet, and is a hardy plant of the nettle tribe. It thrives in almost any clime. Though the use of this plant as a constituent of textile fabrics was not known to the ancients, its seed provided them with an intoxicant. In hot countries the plant, at the expense of the fibre, "becomes powerfully narcotic, and its leaves, flowers, and stem become covered with a peculiar resinous secretion called *churrus* in India. By the Arabs this resin is called *hashash*, and during the Crusades, men intoxicated purposely with it, called 'hashasheens,' used to rush into the camp of the Christians to murder and destroy, whence our word assassin is derived. Hemp is employed in other forms besides churrus as a narcotic. The whole herb, resinous exudation included, is dried and smoked under the name of *gunyah*, or *bhang* when the larger leaves and capsules only are employed. The Hindoos and the Bushmen of Southern Africa smoke these preparations in rude pipes, as we do cigars and tobacco. These pipes are about three inches in length, and are usually made out of the tusks or canine teeth of some animal, perforated through, leaving only the enamel." (John Yeats, "Natural History of Commerce.")

FLAX.

Of flax the great producer is Russia. Out of a total import of 1,581,849 cwt., worth £2,655,500, she sent us 1,195,155 cwt., worth £1,566,759. After Russia the greatest quantity was sent by Belgium, viz., 221,296 cwt., at £722,877. The leading ports at which flax is landed are, first and foremost, Dundee, 578,087 cwt.; Belfast, 268,548 cwt.; Leith, 206,871 cwt.; London, 116,031 cwt., and Liverpool, 96,604 cwt.

The flax plant will grow anywhere almost, and at one time it was extensively cultivated in England. Even yet it is largely produced in Ireland. It is sown broadcast in fields like ordinary cereals, and after flowering is pulled up by the roots. It is then exposed to the sun and to moisture to destroy the outer covering and so set free the tough fibres within. Having been subjected to other processes for separating these fibres, it is heckled—in other words, combed—and then bleached. For the finest linens the heckling is repeated through finer and finer combs. It is from the heckling process that tow comes, which may so far be compared to the combings that result from the dressing of the human hair. The use of flax fibre for human clothing dates from the earliest times, and microscopic inspection of the wrappings round Egyptian mummies shows them to be made of this substance.

WOOL.

In commerce the term wool comprises the hair of the alpaca, vicuña, llama, and other animals. It is only a very small proportion, however, of the total import of this product that does not come from the fleece of the sheep, and of this latter, again, it is a small proportion that does not come from British possessions. The total import of sheep's wool in 1890 was 629,236,209 lb., valued at £26,930,764, which exceeds by more than 3¼ millions sterling the value of the wheat imports of the same year. Of this total 542,304,776 lb. came from British possessions — notably from New South Wales, 127,402,559 lb.; Victoria, 98,300,002 lb.; New Zealand, 95,632,598 lb.; South Africa, 87,221,926 lb.; Queensland, 44,141,456 lb.; and the East Indies, 31,238,586 lb. The vast export trade in Australian wool began in 1807, when the modest quantity of 245 lb. was shipped to England.

A good idea of the varied uses of this commodity may be gathered from the following passage:—"Wools are divided into two great classes—clothing wools and combing wools, or short wools and long wools; and the fabrics woven from them are termed woollens or worsteds, according as the one or the other is employed. The fibres of clothing wools felt or interlace, forming thereby a dense and compact material, suitable for warm and heavy clothing, when manufactured into broad cloths, narrow cloths, felt for hats, blankets, serges, flannels, and tartans. Combing wools, on the contrary, though long in fibre, do not felt, and are therefore employed in the manufacture of light and loose, but still warm, garments, such as stuffs, bombazines, merinoes, hosiery, camlets, and shawls, and various mixed goods, as damasks, plushes, and velvets." (John Yeats, "Natural History of Commerce.")

BRISTLES.

After wool and silk the most important of the animal fibres is the bristle of the pig. It is used in the manufacture of the superior kind of brushes, such as hair, cloth, tooth, shaving, and nail brushes. The bristles enjoying the highest repute come from France, whether produced and prepared there, or only prepared. These are as white as wool and as soft as the hair of an infant. They are used to make shaving-brushes from and even artists' brushes, and the pencils of the painter and decorator. Another high class of selected bristles goes to the shoemaker. These require to be of a certain length and firmness, and fetch a price of, according to quality, from one to seven shillings a pound.

Our total imports of bristles, for such purposes as those mentioned, in 1890 amounted to 2,988,100 lb., valued at £443,200. The chief countries supplying us were Germany, to the extent of 991,971 lb., at £150,806; Russia, 748,512 lb., at £139,610; China, 684,439 lb., at £75,107; British East Indies, 179,582 lb., at £28,927; Hong Kong, 136,093 lb., at £15,255; and France, 97,834 lb., at £13,571. Belgium, Holland, and the United States of America also contributed to our supplies.

For a long time the great bristle-producing country was Russia, whence our imports in one year have exceeded three millions sterling. In that country herds of semi-wild swine roamed the forests, strewn as they were with acorns, berries, and cones. The nearer the animal approaches to the nature of the wild boar, the better is the quality of the bristles it yields. By breeding with a view to enhancing the delicacy of the flesh, the quality of the bristle is deteriorated. From the native Russian pig the yield of bristles is about a pound, and the finest are those from the spine.

They come over tied in bundles and carefully packed in casks. They are sorted according to colour, elasticity, firmness, and length. The expert distributes them into three classes—brown, dark, and white. The elasticity he determines by a brush across the back of his hand. As to the length the standard is six inches, those longer than that being usually deficient in strength, and those shorter being, of course, less adapted for working up into the finished article. The high price of bristles has had the effect of bringing forward many substitutes, and with these bristle brushes have often been adulterated. On the whole, however, these substitutes have proved beneficial, and brushes are to be found now in every household. This could not have been the case had we been confined to bristles and the more costly animal fibres for the material. Vegetable fibres, such as Mexican fibre made from the Istle plant, though their use in brush-making is quite recent, have put it within the power of the poorest housewife to have a scrubbing brush, and so have promoted cleanliness and, as a consequence, wholesomeness just as effectually in their own way as sanitary laws and more elaborate methods of combating one of the necessary evils that accompany industrial progress. Thus does the enterprise of the merchant in search of private gain often work for the general weal in an indirect way, as surely as the public-spirited legislator. For further information respecting fibres the reader is referred to the lessons on Commercial Botany, Vol. IV., pp. 272, 340.

DYE-STUFFS.

Of dye-stuffs imported the highest value is reached by Indigo, viz., £1,521,369 for 81,854 cwt. Of this total £1,386,603 worth, representing 76,869 cwt., come from British possessions, notably Bengal and Madras. Among foreign countries the chief supplier is Central America.

The indigo plant is a native of India, whence it was first introduced to Europe in the seventeenth century. The use of indigo met with considerable opposition, and laws were passed even in England against it, as on account of its superiority as a blue dye it threatened the cultivation of the woad. It is applied to the dyeing of cottons, linens, silks, and woollens, and every washerwoman knows how it enhances the effect of her toil in giving a brilliant whiteness to the articles when dried that have passed through her tub.

The shrubs whence come this valuable product grow to a height of about three feet, and are cut as they begin to flower. A large vat is filled with them, where they are left for a few hours to steep in water. This water, which has become blue, is drawn off into another vat, where it is kept in a state of commotion until it granulates. After settling, the clear water on the top is drawn off and the sediment put into bags to dry. This sediment, after further drying, is cut into cube shapes, and being packed in boxes becomes the indigo of commerce. The refuse of the plants after the juices have been extracted from them is taken back to the fields, where it serves the purposes of manure. Just as the indigo plant encroached upon woad, so it in turn is threatened by the researches of the laboratory, whence is now turned out artificial indigo.

COCHINEAL.

The total annual import of this valuable dye, which originally came from Mexico, amounts to 7,808 cwt., valued at £51,067. Of this 7,640 cwt., of the value of £50,084, are sent from the Canary Islands. Cochineal is used chiefly for dyeing woollens a scarlet colour, and provides brilliant reds, such as carmine.

It is made from an insect so small that 70,000 of these tiny creatures are computed to be required for one pound. They feed on the cactus plant, from which they are scraped into bags. They are then plunged into boiling water, thereby being killed, and afterwards dried in the sun or in stoves. This process produces "black cochineal." When they are put at once into the stove they acquire a peculiar lustre, and go by the term "silver cochineal." After being dried, the cochineal is sifted from particles of the plants that may have become mixed with it. It is then packed in bags of about 150 lb. each, in which form it reaches the market.

From an acre of nopal—the species of cactus specially cultivated for the production of cochineal—the yield of dry cochineal is estimated at 250 lb.

CUTCH AND GAMBIER.

Cutch, also called catechu, and gambier, or gambir, are alike in their chemical composition, and are devoted to similar uses in the arts of the tanner and dyer. Of the total imports of these jungle products—viz., 27,445 tons of the value of £717,820—20,662 tons of the value of £527,336 come from the Straits Settlements, Burmah sending the next largest quantity—viz., 5,097 tons at £145,040.

Cutch is an extract obtained chiefly from two species of acacia—*Acacia catechu* and *Acacia suma.* Formerly both it and gambier were supposed to be an earth, and were known in commerce as *terra japonica.* The wood of the two species of trees named is taken when the trunk has attained the diameter of about a foot. It is then cut up into small pieces, which are boiled in earthenware jars in the open air. After the liquor has attained a certain consistency, it is drawn off into separate vessels, and, ultimately, after being cast into the block forms in which it appears in the market, allowed to harden in the sun. The large amount of tannic acid that cutch contains makes it invaluable as a dye and tanning drug. It is computed that one pound of cutch has as much tanning power as seven or eight pounds of oak bark.

Gambier, known in pharmacy as pale catechu, is prepared from the leaves of *Uncaria Gambir* and *Uncaria acida.* From these trees are stripped the leaves and twigs, which are boiled in shallow pans. The liquor is drawn off and subjected to further evaporation by boiling. As it cools, a stick is worked up and down in it in a peculiar way which tends to harden it. After it has attained sufficient consistency, it is poured into shallow boxes, and then, when dry and hard enough, cut out in cubes of about an inch—the form in which it is known to commerce. A frequent adulterant in gambier is sago or tapioca flour.

VALONIA.

This is also a dyeing and tanning material, and is shipped mainly from Turkey. Our total imports are 25,272 tons, of the value of £501,669, and of this Turkey sends us 22,287 tons, valued at £444,119. It is the commercial term for the acorn cups of a species of oak—*Quercus ægilops.* Towards the end of July and the beginning of August the fruit ripens, and is beaten from the trees. After being gathered, the acorn cups are dried, and then conveyed to the port of shipment, there undergoing in the warehouses a further process of desiccation and partial fermentation. At this stage the acorns drop out of the cups; the whole is then picked over, the cups being separated from the acorns, and the good cups from the bad.

Though the tree from which these cups are procured is an insignificant shrub, yet the cups themselves attain a diameter of nearly 2 inches. They are injured by rain, which robs them of their tannin, and darkens their colour, and to rain they are frequently exposed. Large quantities of them are also damaged in the warehouse while preparing for shipment. The expert, however, easily judges the quality of a consignment from its bright colour, the size, and general appearance of the cup. The acorn itself is used to feed pigs on.

Besides Turkey, Greece also has extensive forests of the valonia-yielding oak. In that country the best quality is gathered in April, while the acorn is still immature, the second quality being collected in September, and a much inferior in October. The crops are liable to a disease, the cause of which is not yet known, which renders the cups useless for industrial purposes, and seems to prevail in seasons when the yield is specially large. Valonia is generally used in conjunction with oak-bark or myrobalans, and in the production of hard and heavy leather.

SUMACH.

Sumach, or sumac, comes mainly from Italy and Sicily, this country out of a total import of 11,432 tons, valued at £126,074, sending us 10,789 tons, of the value of £119,234. It too is used in tanning uppers as well as in dyeing, giving a bright yellow colour to cottons. It is prepared for the market by pulverising the leaves and stems of *Rhus coriaria*, a plant that rises to the height of about 8 feet.

The plants, though they grow wild in several countries, are yet subjected to cultivation, especially in Sicily, and may be reared from seed or from shoots. The leaves are gathered at different seasons in different countries, and according to the state of the plant, and the purposes for which the leaf is intended, and allowed to dry either in the field or in the barn. They are then threshed with the flail to separate them from the branches and stems, the product being "sumach for grinding" or "sumach for baling," according to whether the leaves have been broken up or come from the stems entire. They are then ground in mills, and screened; the final operation being to pack them in bags, each containing 1¼ cwt.

Though the sumac from America contains more tannic acid than the European, yet the latter is preferred by tanners and dyers, as it lends itself better to the production of the finer white fancy leathers used for gloves and shoes. The tanning properties of sumac resemble those of the myrobalan, though of a paler colour, and it is used mostly in tanning morocco and such fancy leathers.

LOGWOOD.

This useful wood comes to us chiefly from the British West India Islands and British Honduras, the former sending 30,713 tons, valued at £159,639, and the latter 16,541 tons, valued at £136,450—our total imports being 63,519 tons, of the declared value of £407,462. It arrives here in the form of logs, and is so hard that it sinks in water. The logs are cut up and ground into a powder, in which form it goes to the dyer. Boiled in water logwood yields a blood-red colour to the water, which a little acetic acid renders bright red. This is the method of making red ink, alum being added to make the colour permanent. In dyeing it is used chiefly for yielding red, blue, and black, various shades being obtainable from it under different processes of treatment.

The history of this wood is interesting, as may be seen from the following extract:—"Logwood seems to have been first brought to England soon after the accession of Queen Elizabeth; but the various and beautiful colours dyed from it proved so fugacious that a general outcry against its use was soon raised; and an Act of Parliament was passed in the twenty-third year of her reign which prohibited its use as a dye under severe penalties, and not only authorised, but directed the burning of it, in whatever hands it might be found within the realm; and, though this wood was afterwards sometimes clandestinely used under the feigned name of blackwood, it continued subject to this provision for nearly 100 years, or until the passing of the Acts 13 & 14 Charles II., the preamble of which declares that the ingenious industry of modern times hath taught the dyers of England the art of fixing colours made of logwood, *alias* blackwood, so as that, by experience, they are found as lasting as the colours made with any other sort of dyeing wood whatever."

MYROBALANS.

Another product that enters into both the tanner's and the dyer's art is the Myrobalan. This is a large nut, the fruit of *Terminalia chebula* and *Terminalia bellerica*, small trees native to British India. The quantity imported amounts to 514,370 cwt., of the value of £209,548; of this, Bombay and

Scinde send 366,933 cwt., valued at £152,372, and Madras 125,095 cwt., valued at £47,684.

Combined with alum myrobalans yield a durable yellow colour, and, mixed with sulphate of iron, a good ink. The outer covering of the nut is the valuable part, while from the kernel is compressed an oil used to strengthen the hair. In calico printing, myrobalans are employed to produce a durable black dye. They are imported in bags containing from 1 cwt. to 1½ cwt.

GREEK.—XX.

[*Continued from p. 49.*]

PARADIGMS OF MUTE VERBS (*continued*).

(2) VERBS WHOSE CHARACTERISTIC IS A *k*-SOUND (κ, γ, χ).

PURE characteristics, κ, γ, χ; impure characteristics in the present and imperfect, ττ (σσ), more rarely ζ.

	Active.	*Middle.*	*Active.*	*Middle.*
Pres.	πλέκ-ω, *I knit*	πλέκ-ομαι.	τάττ-ω, *I set in order*	τάττ-ομαι.
Perf.	πέ-πλεχ-α	πέ-πλεγ-μαι.	τέ-ταχα	τέ-ταγ-μαι.
Fut.	πλέξω (πλέκ-σω)	πλέξομαι.	τάξω	τάξομαι.
Aor.	ἔ-πλεξα	ἐ-πλεξάμην.		ἐ-ταξάμην.
3 Fut.		πε-πλέξομαι.		τε-τάξομαι.

Passive.

1 Aor.	ἐ-πλέχ-θην.	ἐ-τάχ-θην.
1 Fut.	πλεχ-θήσομαι.	ταχ-θήσομαι.
2 Aor.	ἐ-πλάκ-ην.	ἐ-τάγ-ην.
2 Fut.	πλακ-ήσομαι.	ταγ-ήσομαι.

Verbal Adj. πλεκτός, πλεκτέος; τακτός, τακτέος.

VOCABULARY.

Ἁμαρτία, -ας, ἡ, a sin.
Ἀνέλπιστός, -ον, unexpected.
Ἀνορύττω (char. γ) I dig up.
Ἀποκηρύττω (char. γ), I proclaim, disinherit.
Διατάττω, I arrange.
Θεμιστοκλῆς, -έους, ὁ, Themistocles.
Καταπλήττω (char. γ), I strike down, astound, frighten (2 aor. pass. **κατεπλάγην**, 2 fut. pass. **καταπλᾰγήσομαι**).
Καταφλέγω, I burn down.
Κράζω, I croak, cry out, shriek. (The 2 perf. has the force of a present.)
Λίαν, very, very much.
Ὀρέγω, I reach out the hand; *mid.* I desire.
Νεότης, -ητος, ἡ, youth.
Παραπλάζω, I lead astray, mislead.
Πενητεύω, I am poor (**πένης**).
Ταράττω (char. γ), I disturb.
Ταραχή, -ης, ἡ, disturbance, disorder.
Τύμβος, -ου, ὁ, a tomb.
Φυλάττω (char. γ), I guard.

EXERCISE 105.

Translate into English:—

1. **Μὴ τύμβον τεθαμμένου ἀνορύξῃς.** 2. **Αἱ φρενῶν ταραχαὶ παρέπλαγξαν καὶ σοφόν.** 3. **Θεμιστοκλέα, τὸν Ἀθηναῖον, ὁ πατὴρ ἀπεκήρυξε διὰ τὰς ἐν τῇ νεότητι ἁμαρτίας.** 4. **Θεὸς πάντα ἐν τῇ φύσει ἄριστα διατέταχεν.** 5. **Πλοῦτον ἔχων, τοῖς πενητεύουσιν σὴν χεῖρα ὄρεξον.** 6. **Ἐὰν ἔχωμεν χρήματα, ἕξομεν φίλους.** 7. **Λίαν φιλῶν σεαυτόν, οὐχ ἕξεις φίλον.** 8. **Οἱ πολέμιοι ἐδιώχθησαν.** 9. **Πολλὰ μὲν ἀνέλπιστα πράττεται, πολλὰ δὲ πέπρακται, πολλὰ δὲ πραχθήσεται.** 10. **Εἰ πολέμων καὶ πραγμάτων φροντίζεις, ὁ βίος σοῦ ταραχθήσεται.**

EXERCISE 106.

Translate into Greek:—

1. The barbarians were pursued by the Greeks. 2. The barbarians fled into the city. 3. The enemy burnt down the city. 4. Thou carest for war. 5. You care for business. 6. Caring for war and business, thou art troubled. 7. Many fine deeds were done by the Greeks. 8. The women, frightened by the enemy, shrieked.

(3) VERBS WHOSE CHARACTERISTIC IS A *t*-SOUND (δ, τ, θ).

Pure characteristic, τ, δ, θ; impure characteristic in the present and imperfect, ζ, more seldom σσ.

	Active.	*Middle.*	*Active.*	*Middle.*
Pres.	πείθω, *I persuade*	πείθ-ομαι.	φράζ-ω, *I make known*	φράζ-ομαι.
1 Perf.	πέ-πει-κα	πέ-πεισ-μαι.	πέ-φρᾰ-κα	πέ-φρασ-μαι.
2 Perf.	πέ-ποιθ-α, *I trust.*			
Fut.	πεί-σω	πεί-σομαι.	φρά-σω	φρά-σομαι.
1 Aor.	ἔπει-σα.		ἔ-φρᾰ-σα	πε-φρά-σομαι.

Passive.

1 Aor.	ἐ-πείσ-θην.	ἐ-φράσ-θην.
1 Fut.	πεισ-θήσομαι.	φρασ-θήσομαι.

Verbal Adj. πειστέον; φραστέος, -α, -ον.

VOCABULARY.

Ἁμαρτανω, I miss the mark, err, sin.
Ἁρπάζω, I rob, plunder.
Ἀσία, -ας, ἡ, Asia.
Αὖθις, again.
Δίψος, -ους, τό, thirst.
Δράκων, -οντος, ὁ, Draco.
Ἐγκώμιον, -ου, τό, eulogy (our *encomium*).
Ἔτι, yet; **ἔτι δέ**, further.
Εὐφροσύνη, -ης, ἡ, joy, gladness.
Ἔφηβος, -ου, ὁ, youth.
Ἤν (*for* **ἐάν**), if.
Ἤδη, already.
Μαλακίζω, I soften (**μαλακός**, soft).
Μετέπειτα, afterwards, hereafter.
Μιθριδάτης, -ου, ὁ, Mithridates.
Ὄλβος, -ου, ὁ, riches, prosperity, happiness.

Ὀπάζω, I cause to follow, bestow.

Παύω, I cause to cease, I free from; *mid.* I cease.

Πείθω (*with acc.*) I persuade, convince; *perf. mid.* I trust, I yield myself.

Πληγή, -ῆς, ἡ, a stroke.

Ῥῖγος, -ους, τό, stiffness, cold.

Σκεδάζω, I scatter.

Σπανίζω, I make rare, I am rare.

Στρέφω, I turn back.

Συναρμόζω, I put together, fit, accommodate.

Φράζω, I declare, speak.

EXERCISE 107.

Translate into English:—

1. Παῦσον με, ὦ φίλε, πόνων, σκέδασον δὲ μερίμνας, στέψον δὲ αὖθις εἰς εὐφροσύνας. 2. Μιθριδάτης Ἀσίαν ἥρπακεν. 3. Λογίσου πρὸ ἔργου. 4. Οἱ θεοὶ τοῖς θνητοῖς ὄλβον ὤπαταν. 5. Ὁ Θεὸς ἅπαντα συνήρμοκεν. 6. Ἢν σύ κακῶς δικάσῃς, σὲ Θεὸς μετέπειτα δικάσει. 7. Ἐν τοῖς Δράκοντος νόμοις μία ἅπασιν ὥριστο τοῖς ἁμαρτάνουσι ζημία, θάνατος. 8. Ὑπὲρ σεαυτοῦ μὴ φράσῃς ἐγκώμια. 9. Οἱ τῶν Ἑλλήνων ἔφηβοι εἰθίσθησαν φέρειν λῖμόν τε καὶ δίψος καὶ ῥῖγος, ἔτι δὲ πληγὰς καὶ πόνους ἄλλους.

EXERCISE 108.

Translate into Greek:—

1. Cares are scattered. 2. Cares will be scattered. 3. Happiness is bestowed by the gods on mortals. 4. Draco appointed one punishment, (namely) death, for all sins. 5. We shall always admire the Athenians. 6. The Athenians have been always admired. 7. The Greeks accustomed their youth to bear all labours. 8. Socrates was admired on account of his wisdom. 9. The song has scattered all our cares.

LIQUID VERBS.

THE FORMATION OF THE TENSES OF LIQUID VERBS.

Liquid verbs are those whose characteristic is a liquid—namely, λ, μ, ν, or ρ. Liquid verbs form the future active and middle and the first aorist active and middle without the tense-characteristic σ, and yet take the tense-characteristic κ in the first perfect and pluperfect active, as:—

σφάλλω (pure stem ΣΦΑΛ-), *I trip up, stumble;*
σφάλλω, fut. σφαλ-ῶ, 1 aor. ἔ-σφηλ-α, perf. ἔ-σφαλ-κα.

The future-terminations of liquid verbs, -ῶ, -οῦμαι (from -έσω, -έσομαι), are circumflexed like the present active and middle of contracted verbs in -εω, as φιλ-ῶ, φιλ-οῦμαι. Liquid verbs have not the third future.

With few exceptions, the present of those verbs whose stem-vowel is short has undergone a strengthening of the pure stem, which strengthening consists in either the doubling of the λ or the insertion of the liquid ν after the characteristic, as:—σφάλλω, stem ΣΦΑΛ-, present σφάλλω, the λ being doubled; τέμν-ω, pure stem ΤΕΜ-, ν being introduced to form the present. Or in this, that the root-vowel is either lengthened (namely, ῐ is lengthened into ῑ and ῠ into ῡ, as all verbs in -ῑνω, -ῡνω): for example, κρίνω, *I judge;* ἀμύνω, *I ward off;* σύρω, *I draw out,* pure stems, ΚΡΙΝ- (ῐ), ΑΜΥΝ- (ῠ), ΣΥΡ- (ῠ); or the vowel is changed into a diphthong (that is, α into αι, ε into ει): for example, φαίν-ω, *I show;* κτείν-ω, *I kill;* pure stems, ΦΑΝ-, ΚΤΕΝ-. Μέν-ω, *I remain*, and νέμ-ω, *I divide*, retain the form of the pure stem. For example:—

PURE STEMS.	PRESENTS.	ALTERATION.
ΣΦΑΛ-.	σφάλ-λ-ω.	λ doubled.
ΤΕΜ-.	τέμ-ν-ω.	ν introduced.
ΚΡΙΝ-.	κρίν-ω.	ῐ lengthened.
ἈΜΥΝ-.	ἀμύν-ω.	ῠ lengthened.
ΣΥΡ-.	σύρ-ω.	ῠ lengthened.
ΦΑΝ-.	φα-ί-ν-ω.	α changed into αι.
ΚΤΕΝ-.	κτε-ί-ν-ω.	ε changed into ει.

The strengthened (impure) stems thus formed remain only in the present and the imperfect; the other tenses are formed from the pure stem, the short vowel being lengthened by the change of ῐ into ῑ, ῠ into ῡ, ᾰ into η, ε into ει, in the first aorist active and middle: thus—

PURE STEM.	PRESENT.	FUTURE	1 AOR. ACT.	1 AOR MID.
ΣΦΑΛ-.	σφάλλω.	σφαλῶ.	ἔ-σφηλ-α.	ἐ-σφηλ-άμην.

The first perfect active is ἔ-σφαλ-κα, and the second aorist passive is ἐ-σφάλ-ην. The future active always bears a circumflex accent (στελῶ), and the future middle ends in -οῦμαι.

Liquid verbs with monosyllabic stems and the stem-vowel ε take the conversion α in the second aorist, in the first perfect and pluperfect active, the perfect and pluperfect middle or passive, in the first aorist, first and second future passive, as well as in the verbal adjective; and the conversion ο in the second perfect and pluperfect; as in στέλλω, *I send:*—

στέλλ-ω, fut. στελ-ῶ, 1 perf. act. ἔ-σταλ-κα, perf. mid. or pass ἔ-σταλ-μαι, 1 aor. pass. ἐ-στάλ-θην (poet) 2 aor. pass. ἐ-στάλ-ην, verbal adj.

φθείρ-ω, fut. φθερ-ῶ, 1 perf. act. ἔ-φθαρ-κα, perf. mid. or pass. ἔ-φθαρ-μαι, 2 aor. pass. ἐ-φθάρ-ην, verbal adj. φθαρ-τός, but 2 perf. ἔ-φθορ-α.

Verbs of more than one syllable are not capable of conversion, as:—ἀγγέλλω, *I announce,* ἤγγελκα, ἤγγελμαι, ἠγγέλθην.

The following verbs lengthen the short vowel of the stem irregularly, those in -αινω changing αι not into η but ᾱ, as :—*ἰσχναίνω, I make lean, ἴσχνᾱνα, ἰσχνᾶναι*; *κερδαίνω, I gain, ἐκέρδᾱνα, κερδᾶναι*; *κοιλαίνω, I hollow, ἐκοίλᾱνα, κοιλᾶναι*; *λευκαίνω, I make white*; *ὀργαίνω, I make angry*; *πεπαίνω, I make ripe*; also by all in *-ραίνω*, as :—*περαίνω, I finish*, fut. *περᾰνῶ*, aor. *ἐπέρᾱνα*, inf. *περᾶναι*; and by all in *-ιαίνω*, as :—*πιαίνω, I make fat, ἐπίᾱνα, πιᾶναι* (except *μιαίνω, I spot, μιῆναι*). Also *αἰρῶ, I take*, and *ἅλλομαι, I leap*, belong here—*ἦρα, ἆραι, ἡλάμην, ἅλασθαι*.

The first perfect active of verbs with the characteristic *ν* must end in *-γκα*, as *με-μίαγ-κα* (from *μιαίνω*), instead of *με-μίαν-κα*. This form, however, is found only among the later writers. There are also other forms, as :—*κερδαίνω, I gain*, perf. *κεκέρδᾰκα*; *μένω, I remain, μεμένηκα*, from **ΜΕΝΕΩ**. Many verbs have no perfect. Also, the verbs with *μ* for their characteristic form the perfect from a theme in *-ε*, as *νέμ-ω, I divide, νενέμηκα*, as from **ΝΕΜΕΩ**.

The three verbs following, with *ν* for their characteristic, eject the *ν* not only in the perfect and pluperfect active, but also in the perfect and pluperfect middle or passive, in the first aorist passive, and in the verbal adjective :—

κρίνω, I separate	*κέκρῐκα*	*κέκρῐμαι*	*ἐκρίθην.*
κλίνω, I bend	*κέκλῐκα*	*κέκλῐμαι*	*ἐκλίθην.*
πλύνω, I wash	*πέπλῠκα*	*πέπλῠμαι*	*ἐπλύθην.*

Respecting the formation of the perfect middle or passive, observe the following :—

When *σθ* would follow a liquid, the *σ* is thrown out, as *ἠγγέλσθαι, ἠγγέλθαι*; so *πεφάνθαι*.

In verbs in *-αινω* and *-ῡνω*, the *ν* before the termination beginning with *μ* commonly disappears, and a *σ* is introduced to strengthen the syllable, as *φαίν-ω. πέφα-σ-μαι, πεφά-σ-μεθα*; but in some verbs of this kind the *ν* assimilates itself to the following *μ*, as *παροξύνω, I sharpen, excite, παρώξυμ-μαι*, inf. *παρωξύν-θαι*; *αἰσχύνω, I cause shame, ᾔσχυμ-μαι*, inf. *ᾐσχῦν-θαι*.

In the second perfect (which, however, is formed by only a few verbs) the short stem-vowel is lengthened before the termination *-α*, as in the first aorist active, except verbs having *ε* in the future, which take the conversion *ο*, as :—*φαίν-ω*, 1 aor. *ἔ-φην-α*, 2 perf. *πέ-φην-α*.

PARADIGM OF LIQUID VERBS.

We now give a short paradigm of the liquid verbs, arranged according to the stem-vowels of the future.

(1) *With ᾰ in the Future.*

φαίνω, I show, pass. *φαίνομαι, I appear*; fut. act. *φανῶ*, fut. mid. *φαν-οῦμαι, I shall shine*; 2 perf. act. *πέ-φην-α, I shine forth*; 1 aor. act. *ἔ-φην-α*, 1 aor. mid. *ἐ-φην-άμην*; *ἀπεφηνάμην, I declare*.

INFLECTIONS OF THE PERFECT PASSIVE.

IND. *Sing.*	*πέ-φασ-μαι.*	IMPERAT. *Sing.*	*(πέ-φαν-σο)*
	πέ-φαν-σαι.		*πε-φάν-θω.*
	πέ-φαν-ται.	*Dual.*	*πέ-φαν-θον.*
Dual.	*πέ-φαν-θον.*		*πε-φάν-θων.*
	πέ-φαν-θον.	*Plur.*	*πέ-φαν-θε.*
Plur.	*πε-φάσ-μεθα.*		*πε-φάν-θωσαν* or *πε-φάν-θων.*
	πέ-φαν-θε.		
	πε-φασ-μένοι εἰσί(ν).	INFINITIVE.	*πε-φάν-θαι.*
		PARTICIPLE.	*πε-φασ-μένος.*

(2) *With ε in the Future.*

στέλλ-ω, I send.

	Active.	*Middle.*		*Passive.*
Pres.	*στέλλ-ω.*	*στέλλ-ομαι.*	1 Aor.	*ἐ-στάλ-θην.*
1 Perf.	*ἔ-σταλ-κα.*	*ἔ-σταλ-μαι.*	1 Fut.	*σταλ-θήσομαι.*
Fut.	*στελ-ῶ.*	*στελ-οῦμαι.*	2 Aor.	*ἐ-στάλ-ην.*
1 Aor.	*ἔ-στειλ-α.*	*ἐ-στειλ-άμην.*	2 Fut.	*στᾰλ-ήσομαι.*

Verb. Adj. σταλ-τός, σταλ-τέος.

(3) *With ῐ and ῠ in the Future.*

(*a*) *τίλλ-ω, I pluck*; *σύρ-ω, I pull.*

Present.	*τίλλ-ω.*	*σύρ-ω.*
	τίλλ-ομαι.	*σύρ-ομαι.*
Perfect.	*τέ-τιλ-κα.*	*σέ-συρ-κα.*
	τέ-τιλ-μαι.	*σέ-συρ-μαι.*
Future.	*τῐλ-ῶ.*	*σῠρ-ῶ.*
	τῐλ-οῦμαι.	*σῠρ-οῦμαι.*
1 Aorist.	*ἔ-τῑλ-α.*	*ἔ-σῡρ-α.*
	ἐ-τῑλ-άμην.	*ἐ-σῡρ-άμην.*
1 Aorist Pass.	*ἐ-τίλ-θην.*	*ἐ-σύρ-θην.*
1 Future Pass.	*τιλ-θήσρμαι.*	*συρ-θήσομαι.*
2 Aor. and 2 Fut. Pass.	*ἐ-σύρ-ην.*	*συρ-ήσομαι.*

Verb. Adj. τιλ-τός, τιλ-τέος; *συρ-τός, συρ-τέος.*

(*b*) *κλίν-ω, I bend*; the *ν* drops.

	Active.	*Middle.*		*Passive.*
Pres.	*κλίν-ω.*	*κλίν-ομαι.*	1 Aor.	*ἐ-κλί-θην.*
Perf.	*κέ-κλῐ-κα.*	*κέ-κλῐ-μαι.*	2 Aor.	*ἐ-κλίν-ην.*
Fut.	*κλῐν-ῶ.*	*κλῐν-οῦμαι.*	1 Fut.	*κλῐ-θήσομαι.*
1 Aor.	*ἔ-κλῑν-α.*	*ἐ-κλῑν-άμην.*	2 Fut.	*κλῐν-ήσομαι.*

Verb. Adj. κλι-τός, κλι-τέος.

The inflections of the perfect middle or passive *κέ-κλι-μαι* follow *βε-βούλευ-μαι*.

VOCABULARY.

Ἀδύνατος, *-ου*, impossible.
Ἀποκτείνω, I kill.
Αὔξησις, *-εως*, *ἡ*, increase, prosperity.
Γυῖα, *-ας*, *ἡ*, a field.
Διαφθείρω, I destroy, I lay waste.
Ἐκφαίνω, I bring to light, show, display.
Ἐξοκέλλω, I drive [properly used of a ship] from the right way, mislead (*from ὀκέλλω*, I drive ashore).

Κερδαίνω, I gain, earn, derive advantage (*κέρδος*).
Κρυπτός, -ή, -όν, hidden; *τὸ κρυπτόν*, the hidden thing, mystery, secret.
Μιαίνω, I spot *or* stain.
Ναυηγός, -οῦ, ὁ (in Latin *naufrăgus*), a shipwrecked person.
Οἰκτείρω, I pity.
Παραδόξως, unexpectedly (our *paradox*).
Σπείρω, I sow.
Σφάλλω, I trip up, throw down.

EXERCISE 109.

Translate into English :—

1. *Κρῖναι φίλους οὐ ῥᾴδιον.* 2. *Ὁ πλοῦτος πολλάκις ἐξώκειλε τὸν κεκτημένον εἰς ἕτερον ἦθος.* 3. *Ὁ ἄγγελος ἐπήγγειλε τὴν νίκην.* 4. *Οἱ πολέμιοι τὴν χώραν διέφθειραν.* 5. *Ναυηγοὺς οἴκτειρον, ἐπεὶ πλοῦς ἐστὶν ἄδηλος.* 6. *Ἢν ἀποκτείνης ἐχθρόν σου, χεῖρα μιανεῖς.* 7. *Ἐγὼ μὲν σπερῶ τὰς γυίας; ὁ δὲ Θεὸς αὔξησιν παρέξει.* 8. *Τὰ κρυπτὰ μὴ ἐκφήνης φίλου.* 9. *Φύσιν πονηρὰν μεταβαλεῖν οὐ ῥᾴδιον.* 10. *Ἡ τύχη πολλάκις τοὺς μέγα φρονοῦντας παραδόξως ἔσφηλεν.*

EXERCISE 110.

Translate into Greek :—

1. The boys spot their hands. 2. It is not possible to judge friends. 3. Many persons have been corrupted by luxury. 4. The victory was announced by the messengers. 5. Good men will pity the poor. 6. By thy skill thou hast made much gain. 7. Friends will not declare the secrets of friends. 8. The citizens sow the fields.

VOCABULARY.

Ἀθλητής, -οῦ, ὁ, an athlete *or* combatant *or* competitor.
Αἰσχύνω, I shame; 1 *aor. pass.* I am ashamed.
Ἀμύνω, I ward off, avoid, avenge myself.
Ἀποφαίνω, I show, declare.
Διασπείρω, I scatter abroad (in Latin *dissemino*).
Ἧττα, -ης, ἡ, a defeat.
Κοινός, -ή, -όν, common.
Κρότων, -ωνος, ὁ, Croton.
Μεθώνη, -ης, ἡ, Methoné, a city in Macedonia.
Μίλων, -ωνος, ὁ, Milo.
Ὅρασις, -εως, ἡ, sight.
Παροξύνω, I encourage.
Περαίνω, I accomplish.
Πλήττω, I strike, wound.
Πολιορκία, -ας, ἡ, a siege.
Σπουδάζω, I make haste, I am in earnest.
Στάδιον, -ου, τό, a measure of length (about 600 feet), a race-course.
Ταῦρος, -ου, ὁ, a bull.
Τόξευμα, -ατος, τὸ, an arrow.

EXERCISE 111.

Translate into English :—

1. *Οἱ στρατιῶται ὑπὸ τοῦ στρατηγοῦ εἰς τὴν μάχην παρωξύνθησαν.* 2. *Φίλιππος ἐν τῇ πολιορκίᾳ τῆς Μεθώνης εἰς τὸν ὀφθαλμον πληγεὶς τοξεύματι διεφθάρη τὴν ὅρασιν.* 3. *Σοφίας ὁ κάρπος οὔποτε φθαρήσεται.* 4. *Αἰσχυνθείην φροντίζειν τῆς ἐμαυτοῦ δόξης ἢ τῆς κοινῆς σωτηρίας.* 5. *Μίλων, ὁ ἐκ Κρότωνος ἀθλητής, ταῦρον ἀράμενος ἔφερε διὰ τοῦ σταδίου μέσου.* 6. *Εἰς τὴν πόλιν διέσπαρτο ὁ λόγος τοὺς πολεμίους νικηθῆναι.* 7. *Οἱ πολῖται τοὺς πολεμίους περὶ τῆς ἥττης ἀμυνοῦνται.*

EXERCISE 112.

1. The general encouraged the soldiers to the fight. 2. The generals encourage the soldiers. 3. The citizens avenge themselves on the enemy for their defeat. 4. If thou art in earnest, thou wilt readily accomplish all things. 5. All things have been accomplished by him because he was in earnest. 6. The scattered foes will appear again. 7. A good citizen cares more for the public good than for his own. 8. By the victory all the citizens were gladdened. 9. The city has been destroyed by the enemy.

ETYMOLOGICAL VOCABULARY.

One of the chief excellencies of the Greek language is the facility of combination which exists among its elements. One word may form the basis of a score, nay, of a hundred words. This fact may be illustrated in the word *ναυηγός*, which we had in the last vocabulary but one. The word is composed of two terms—*ναῦς*, *a ship*, and *ἄγνυμι*, *I break;* and the compound *ναυᾱγία*, which we render *ship-wreck*, is literally *ship-break*, exactly agreeing with the German *schiffbruch*.

Let us, in order to illustrate the power of combination in Greek, give the derivations from *ναῦς*:—

ΝΑΥΣ, a ship. Hence—
Ναυαγέω, I suffer shipwreck (*ἄγνυμι*, I break).
Ναυᾱγία, a shipwreck.
Ναυάγιον, a wreck.
Ναυᾱγός, a wrecked person.
Ναυαρχέω, I command a ship (*ἀρχή*, command).
Ναυαρχία, command of a ship.
Ναυαρχίς, -ίδος, ἡ, the admiral's ship.
Ναύαρχος, the commander of a fleet.
Ναυβάτης, a ship's passenger (*βαίνω*, I go).
Ναυκληρέω, I possess a ship, I carry on a trade in ships (*κλῆρος*, a lot, inheritance, property).
Ναυκληρία, the profession of a ship-merchant.
Ναύκληρος, a ship-merchant.
Ναυκρατέω, I conquer in a ship, a sea-fight (*κράτος*, strength).
Ναυκράτης, a conqueror by sea.
Ναυκρατία, supremacy on the sea.
Ναῦλον, fare payable on a sea-voyage.
Ναυλοχέω, I am in port (*λόχος*, a station), preparing for sea.
Ναυλοχία, being in port, harbour, *or* dock.
Ναυλόχιον, a harbour.
Ναυλόω, I hire out ships.
Ναυμαχέω, I fight on shipboard (*μάχη*, battle).
Ναυμαχησείω, I desire to fight on sea.
Ναυμαχία, a sea-fight.

Ναύμαχος, one who fights by sea.
Ναυπηγέω, I build a ship (πήγνυμι, I put together).
Ναυπηγία, ship-building.
Ναυπηγός, a shipwright.
Ναυσία, ship-sickness—that is, sea-sickness (our *nausea*).
Ναυσίβιος, living by shipping (βίος, life).
Ναυσικλειτός, distinguished by ships (κλειτός, distinguished).
Ναυσίπορος, navigable (Latin, *navis* and *ago*).
Ναυστολέω, I send by ship (στέλλω, I send).
Ναυστόλημα, seafaring.
Ναύστολος, one who ships goods.
Ναύτης, a shipper, a sailor.
Ναυτικός, relating to a sailor (our *nautical*).
Ναυτίλος, a little sailor (our *nautilus*).
Ναυφάγος, ship-destroying (φάγω, I eat).
Ναυφθορία, loss of ship (φθείρω, I destroy).
Ναύφρακτος, protected by ships (φράσσω, I hedge in).
Ναυφυλακέω, I guard a ship (φυλάττω, I guard).

Here we have some forty words, all of which have for their primary root the word ναῦς, *a ship*. It would be easy to augment the number, for we have given only the more important words. The student should carefully mark the secondary compounds, and notice how each one in combination with ναῦς forms a new set of words. Each of these secondary compounds (ἄγνυμι, ἀρχή, βαίνω, etc.) he should trace out in the combinations which they severally form with other words. If this plan were followed out analytically and synthetically, he would find that the immense vocabulary of the Greek language could be classified and arranged under a number of roots so small as to be easily learnt.

DEVIATIONS.

SPECIAL PECULIARITIES IN THE FORMATION OF SOME VERBS, BOTH PURE AND IMPURE—STRENGTHENED STEMS.

Very many active verbs form the future with the middle form, as :—ἀκούω, *I hear*, fut. ἀκούσομαι, aor. ἤκουσα ; ἀπαντάω, *I meet with*, fut. ἀπαντήσομαι, aor. ἀπήντησα ; ἀπολαύω, *I enjoy*, fut. ἀπολαύσομαι, aor. ἀπέλαυσα ; etc.

The following verbs in -αιω and -εω, whose stem originally ended in αυ and ευ, resume the αυ and ευ in the aorist and future, and partly also in the perfect :—

καίω, *I burn*, fut. καύσω, aor. ἔκαυσα, perf. κέκαυκα, perf. pass. κέκαυμαι, aor. pass. ἐκαύθην, fut. pass. καυθήσομαι.
κλαίω, *I weep*, fut. κλαύσομαι *or* κλαυσοῦμαι, aor. ἔκλαυσα.
θέω, *I run*, fut. θεύσομαι *or* θευσοῦμαι. (The other tenses are wanting, many being supplied from the verb τρέχω, which is itself imperfect, and has to be supplemented from other sources.)
νέω, *I swim*, fut. νεύσομαι *or* νευσοῦμαι, aor. ἔνευσα, perf. νένευκα.
πλέω, *I sail*, fut. πλεύσομαι (commonly πλευσοῦμαι), aor. ἔπλευσα, perf. πέπλευκα, perf. pass. πέπλευσμαι, aor. pass. ἐπλεύσθην.
πνέω, *I breathe*, *blow*, fut. πνεύσομαι *or* πνευσοῦμαι, aor. ἔπνευσα, perf. πέπνευκα, perf. pass. πέπνευσμαι, aor. pass. ἐπνεύσθην.

Remark that ῥέω, *I flow*, has fut. ῥυήσομαι, aor. ἐρρύην, perf. ἐρρύηκα. Also that χέω, *I pour out*, deviates from the foregoing—fut. occasionally being χεῶ, though more frequently χεύσω, aor. ἔχεα, perf. κέχυκα, fut. mid. χέομαι, aor. mid. ἐχεάμην, perf. mid. or pass. κέχυμαι, aor. pass. ἐχύθην, fut. pass. χυθήσομαι.

The following verbs, in addition to the common future in -σομαι, have a form in -σοῦμαι. This circumflexed future is called the Doric :—

φεύγ-ω, *I flee*, fut. φευξοῦμαι, also φεύξομαι.
παίζ-ω, *I play*, fut. παιξοῦμαι, also παίξομαι.
πίπ-τω, *I fall*, fut. πεσοῦμαι.

The verbs κλαίω, πλέω, πνέω, νέω, and θέω, given above, employ this form of the future.

The following pure and impure verbs, which, by the assumption of an ε as characteristic, pass into the analogy of pure verbs in their transformations, have independent forms for the subjunctive perfect and optative pluperfect, middle or passive :—

κτά-ομαι, *I acquire ;* perf. κέκτημαι, *I possess ;* subj. κεκτῶμαι, -ῇ, -ῆται ; plup. ἐκεκτήμην, *I possessed ;* opt. κεκτῴμην, -ῷο, -ῷτο, *or* κεκτῄμην, κεκτῇο, κεκτῇτο.
καλέω, *I call ;* perf. κέκλημαι, *I am called*, *I bear the name ;* plup. ἐκεκλήμην, opt. κεκλῄμην, -ῇο, -ῇτο.

SYNCOPE AND METATHESIS.

Some verbs, in some of their forms, throw out the stem-vowel, which stands between two consonants. This ejection is termed *syncope.* Thus, ἐγείρω, *I awake*, transitively (the aorist is regular, ἤγειρα), 1 perf. ἐγήγερκα, *I have awakened ;* 2 perf. ἐγρήγορα, *I am awake ;* 2 plup. ἐγρηγόρη, *I awoke* (intransitive) ; aor. mid. ἠγρόμην, *I awoke* (intransitive) ; πέτομαι, *I fly*, fut. πτήσομαι, aor. ἐπτόμην, inf. πτέσθαι.

By *metathesis* is meant the displacement of a vowel by a liquid. Thus, in τέτμηκα, *I have cut*, from τέμνω (for τέ-τεμ-κα), the liquid μ has taken the place of the vowel ε, which is lengthened into η ;

so in πτήσομαι, from πέτομαι, *I fly*; and so in βέβληκα, from βάλλω, as appears in these instances:—

βάλλω, *I throw*, fut. βαλῶ, aor. ἔβαλον (ΒΑΛ-), perf. βέβληκα; perf. pass. βέβλημαι; aor. pass. ἐβλήθην, fut. pass. βληθήσομαι, 3 fut. βεβλήσομαι.

δαμάζω, *I tame*, fut. δαμάσω, aor. ἐδάμασα (ΔΜΑ-), perf. δέδμηκα; perf. pass. δέδμημαι; aor. pass. ἐδμήθην, ἐδάμην.

καλέω, *I call*, fut. καλῶ, aor. ἐκάλεσα, perf. κέκληκα; perf. pass. κέκλημαι; 3 fut. κεκλήσομαι, aor. pass. ἐκλήθην, fut. mid. καλοῦμαι, aor. ἐκαλεσάμην.

κάμνω (Lat. *labōro*), *I labour, I am in trouble*, 2 aor. ἔκἄμον, fut. καμοῦμαι, perf. κέκμηκα.

τέμνω, *I cut*, 2 aor. ἔτεμον, fut. τεμῶ, perf. τέτμηκα; mid. *I cut something for myself*, perf. pass. τέτμημαι, aor. pass. ἐτμήθην, 3 fut. τετμήσομαι.

KEY TO EXERCISES.

Ex. 103.—1. The boy had written the letter. 2. The enemy sent ambassadors into the city. 3. Not even all time can (lit. *could*) blot out the friendships of good men. 4. Anger often hides (*gnomic aorist*) man's reason. 5. Time buried the power of the Thebans in the grave of (lit. *along with*) Epaminondas. 6. Euripides was buried in Macedonia. 7. God has hidden the future from men. 8. You would be pleased at hearing a sweet melody. 9. The soldiers left their ranks.

Ex. 104.—1. Ἡ ἐπιστολὴ ὑπὸ τοῦ παιδὸς γέγραπται. 2. Ὁ παῖς τὴν ἐπιστολὴν ἔγραψεν. 3. Οἱ παῖδες τὴν ἐπιστολὴν γεγράφασι. 4. Πρεσβεῖς ἐπέμφθησαν εἰς τὴν πόλιν ὑπὸ τῶν πολεμίων. 5. Οἶνος πολλάκις φαίνει ἃ ἄνθρωπος ἐν τῇ καρδίᾳ κέκρυφεν. 6.

8. Καλὸν μέλος ἡμᾶς τέρπει. 9. Οἱ πολέμιοι τὴν πόλιν ἀνέτρεψαν.

ITALIAN.—XIV.

[*Continued from p.* 65.]

INTERROGATIVE PRONOUNS.

Chi? meaning *who?* is used in speaking of persons of both genders and numbers.

Che? signifying *what?* is used in speaking of things.

Quale? signifying *what?* is always joined to a substantive, and used in speaking of men or things of both genders.

INDEFINITE PRONOUNS.

Alcuno, *some, anyone, some people*, is sometimes used alone, and sometimes with a substantive; in the latter case it must agree with it in gender and number.

Altro, signifying *differently, something else, another*, etc., may be used alone, or with a substantive; in the latter case it agrees with the substantive in gender and number.

Ciascheduno and *ciascuno*, meaning *everyone, each*, etc., are used either alone or with substantives. When they are prefixed to substantives, they agree with them in gender, and seldom admit of a plural.

Nessuno or *nissuno, niuno* or *nullo*, meaning *nobody, anyone, no one, no*, etc., are employed alone or with nouns. If they are united to a noun they must agree with it in gender.

Ogni, signifying *every, all*, is indeclinable. It is put before nouns in the singular, and seldom in the plural.

Tutto, signifying *everything, all*, joined to a noun, is liable to gender and number.

VERBS.

Every verb must agree with its subject, either expressed or understood, in number and person.

Two nouns or subjects in the singular, united by e, *and*, require the verb in the plural.

The following verbs have no preposition after them before a following infinitive:—

Bisogna, or Bisognare, *it is necessary.*
Convenire, *to agree.*
Dovere, *we ought.*
Fare, *to do.*
Intendere, *to intend.*
Lasciare, *to let.*
Osare, *to dare.*
Parere, *to seem.*
Potere, *to be able.*
Sapere, *to know.*
Sembrare, *to seem.*
Sentire, *to hear.*
Solere, *to be accustomed.*
Vedere, *to see.*
Volere, *to choose.*
Udire, *to hear.*

The following verbs have *di* after them before a following infinitive:—

Abborrire, *to abhor.*
Accadere, *to happen.*
Accennare, *to show.*
Accertare, *to assure.*
[illegible]
Accordare, *to grant.*
Accorgersi, *to perceive.*
Affliggersi, *to grieve.*
Ammonire, *to admonish.*
Annoiarsi, *to be weary.*
Ardire, *to dare.*
Arrischiare, *to venture.*
Assicurare, *to assure.*
Astenersi, *to abstain from.*
Attentarsi, *to attempt.*
Avvedersi, *to perceive.*
Avventurare, *to venture.*
Avvertire, *to admonish.*
Avvisare, *to inform.*
Badare, *to mind.*
Biasimare, *to blame.*
Bramare, *to wish.*
Cercare, *to seek.*
Cessare, *to cease.*
Chiedere, *to ask.*
Comandare, *to command.*
Commendare, *to commend.*
Commettere, *to commit.*
Concedere, *to grant.*
Conchiudere, conchiudere, *to conclude.*
Consigliare, *to ad-*
[illegible]
Contenersi, *to refrain oneself.*
Contentarsi, *to consent.*
Convenire, *to agree.*
Credere, *to believe.*
Curare, *to cure.*
Degnarsi, *to deign.*
Deliberare, *to deliberate.*
Determinare, *to determine.*
Differire, *to differ.*
Dilettarsi, *to delight.*
Dimandare, *to ask.*
Dimenticarsi, *to forget.*
Dire, *to tell.*
Dispensare, *to dispense.*
Disperare, *to despair.*
Dispiacere, *to dislike.*
Dolersi, *to grieve.*
Domandare, *to ask.*
Dubitare, *to doubt.*
Esitare, *to hesitate.*
Evitare, *to avoid.*
Favorire, *to be so good as.*
Fermarsi, *to stop.*
Fingere, *to pretend.*
Finire, *to finish.*
Fissare, *to fix.*
Giudicare, *to judge.*
Giurare, *to swear.*
Gloriarsi, *to pride oneself.*
Godere, *to delight.*
Guardarsi, *to be-*
[illegible]
imagine.
Impedire, *to hinder.*
Imporre, *to impose.*
Incaricare, *to charge.*
Increscere, *to be sorry.*
Infingersi, *to pretend.*
Ingegnarsi, *to endeavour.*
Intendere, *to understand.*
Lamentarsi, *to complain.*
Lasciare, *to cease.*
Lusingarsi, *to flatter oneself.*
Mancare, *to fail.*
Meditare, *to meditate.*
Meritare, *to deserve.*
Minacciare, *to threaten.*
Mostrare, *to show.*
Negare, *to refuse.*
Negligentare, *to neglect.*
Obbligare, *to oblige.*
Offrirsi, *to offer.*
Ordinare, *to order.*
Omettere, *to omit.*
Osare, *to dare.*
Parere, *to appear.*
Pensare, *to think.*
Pentirsi, *to repent.*
Permettere, *to permit.*

Persuadere, *to persuade.*
Piacere, *to like.*
Pregare, *to entreat.*
Prescrivere, *to prescribe.*
Presumere, *to presume.*
Pretendere, *to pretend.*
Procurare, *to try.*
Professare, *to profess.*
Proibire, *to prohibit*
Proporre, *to propose.*
Promettere, *to promise.*
Ricordarsi, *to remember.*
Ricusare, *to refuse.*
Rimproverare, rinfacciare, *to reproach.*
Rincrescere, *to be sorry.*
Ringraziare, *to thank.*
Riprendere, *to reprove.*
Risolvere, *to resolve.*
Scegliere, *to choose.*
Scommettere, *to bet.*
Scongiurare, *to conjure, to entreat.*
Sconsigliare, *to dissuade.*
Scordarsi, *to forget.*
Scusarsi, *to excuse oneself.*
Sembrare, *to seem.*
Sospirare, *to sigh.*
Sostenere, *to support.*
Sperare, *to hope.*
Svolgere, *to dissuade.*
Supplicare, *to entreat.*
Temere, *to fear.*
Tentare, *to try.*
Tremare, *to tremble.*
Tralasciare, *to desist.*
Vergognarsi, *to be ashamed.*

The following verbs have *a* after them before a following infinitive :—

Accendere, *to excite.*
Accompagnare, *to accompany.*
Accostumarsi, *to accustom.*
Adescare, *to allure.*
Affrettare, *to hasten.*
Agevolare, *to facilitate.*
Aiutare, *to assist.*
Alletare, *to allure.*
Andare, *to go.*
Animare, *to animate.*
Arrivare, *to arrive.*
Aspirare, *to aspire.*
Attendere, *to apply oneself.*
Avere, *to have.*
Avvezzare, *to accustom.*
Avvezzarsi, *to accustom oneself.*
Cominciare, *to begin.*
Condannare, *to condemn.*
Condiscendere, *to condescend.*
Condurre, *to conduct.*
Consentire, *to consent.*
Consigliare, *to advise.*
Continuare, *to continue.*
Convenire, *to agree.*
Costringere, *to oblige.*
Darsi, *to addict oneself.*
Disporre, *to dispose.*
Eccitare, *to excite.*
Esortare, *to exhort.*
Esporsi, *to expose oneself.*
Farsi, *to become.*
Giungere, *to arrive.*
Imparare, *to learn.*
Impegnarsi, *to pledge.*
Incitare, *to incite.*
Incoraggiare, *to encourage.*
Indurre, *to induce.*
Insegnare, *to teach.*
Intraprendere, *to undertake.*
Mettersi, *to set about.*
Obbligare, *to oblige.*
Obbligarsi, *to oblige oneself.*
Occuparsi, *to occupy oneself.*
Offrirsi, *to offer oneself.*
Ostinarsi, *to persist.*
Pensare, *to think about.*
Persuadere, *to persuade.*
Prepararsi, *to prepare oneself.*
Principiare, *to begin.*
Riuscire, *to succeed.*
Seguire, seguitare, *to continue, to follow.*
Spingere, *to urge.*
Stentare, *to work hard.*
Supplicare, *to entreat.*
Tendere, *to tend.*
Tornare, *to return.*
Venire, *to come.*

PARTICIPLES.

The past participle, used without an auxiliary, must agree in gender and number with the substantive to which it refers.

The past participle, being used with the verb essere, *to be*, must agree with its subject in gender and number.

The past participle, used with any tense of the verb avere, *to have*, is indeclinable when it stands before, and nearest to, the word which it governs. When the auxillary verb intervenes, or the object precedes, the participle agrees with the object in number and gender. (*Ho scritto una lettera ; non le ho veduta ; le miserie lasciate hai.*)

ADVERBS.

The Italian adverbs are generally placed after the verb in its simple tenses, or between the auxiliary and the past participle in its compound tenses.

There are many exceptions, for the Italians place sometimes the adverbs in the beginning, in the middle, or at the end of a sentence.

PREPOSITIONS.

In Italian, prepositions are commonly placed before the words which they govern, *e.g.* :—

Fatelo per me, *do it for me.*
Vicino al fonte, *near the fountain.*

CONJUNCTIONS.

The following conjunctions, and all those that are attended by a preposition, require the verb which follows them to be put in the infinitive :—

A fine di, *in order to.*
Avanti di, *before.*
Dopo, *after.*
In vece di, *instead of*
Per, *to.*
Per paura di, *for fear.*
Prima di, *before.*
Senza, *without.*

The following conjunctions require the verb which follows them to be put in the indicative :—

A causa che, *because.*
Di maniera che, *so that.*
In tanto che, *so that.*
Mentre che, *whilst.*
Oltre che, *besides that.*
Secondo che, *according as.*
Se non che, *except.*
Subito che, *as soon as*, etc.

The following conjunctions require the verb which follows them to be put in the subjunctive :—

Acciocchè, *that.*
Affinchè, *in order that.*
Ancorchè, *though.*
Anzi che, *before that.*
Avanti che, *before that.*
Avvegnachè, *though.*
Benchè, *although.*
Caso che, *in case that.*
Come che, *although.*
Come se, *as if.*
Con patto che, *on condition that.*
Contuttoche, *although.*
Dato che, *suppose that.*
Innanzi che, *before that.*
Purchè, *provided that.*
Quando anche, *although.*
Quantunque, *though.*
Quasi, *as if.*
Pognamo che, *suppose that.*
Prima che, *before that.*
Senza che, *without that.*

The following conjunctions sometimes govern the indicative, and sometimes the subjunctive :—

Fino che, finchè, finattantochè, infino che, infinchè, infinattantochè, *till* or *until.*
Perchè, *why.*
Quando, *when.*
Se, *if.*
Eccetto che, *unless.*
Sebbene, *though.*
Se bene, *although.*
Che. *that.*
Conciosiachè, conciossiacosachè, *for.*
Atteso che, *since.*

THE ORGANS OF SENSE.—VIII.

[*Continued from p.* 44.]

IV.—THE ORGAN OF TASTE (*continued*).

CONSIDERING, then, the sense of taste in relation to its uses, we find that not only does it stand at the entrance of the passage for food, to guard the gate, in order to admit good citizens and exclude conspirators against the constitution, as the sense of smell does, but it has other important functions.

First, it stimulates to the act of grinding the food and reducing it to a pulp, giving, by the pleasure it occasions during the process, an inducement which the bare knowledge of the fact that this comminution is necessary for the after digestive operations of the stomach, could hardly supply. Secondly, from the sensibility of the tongue becoming greater as the food proceeds backwards, it causes it to be carried in that direction while being masticated; and finally, in order to enjoy the most exquisite sensation of taste, the feeder finds it necessary to fling the bolus backward on to the root of the tongue, and there it becomes the subject of a curious mechanical process. Until the food has reached this point, it is perfectly under the control of the will of the feeder, and it can be moved in any direction, and entirely ejected from the mouth, if he find it hard or nauseous; but directly it has reached this point it passes at once out of his control. The presence of food at this point excites what is called the reflex, or involuntary, action of the muscles of the throat, so that the soft palate above the throat behind seizes it and thrusts it at once rapidly down into the stomach. This involuntary action is curious, not only because the presence of food invariably excites it, but it cannot be excited unless by the presence of some substance at that part. The act of swallowing cannot be effected unless there be something to swallow. Further, if a foreign body touch this sensitive part, and it cannot be swallowed, the stimulus is so violent that, being denied its legitimate result, it will excite the reversed action and occasion vomiting. Thus, while Nature ungrudgingly grants sensuous gratification where bodily wants exist, she imperiously denies all pleasure if no good end is connected with its gratification. However sad the fact may be to him, the glutton knows that there is a strict limit to his enjoyment. Alas for him! he cannot by any device revel in the pleasures of the table without filling his stomach, and this is of very limited capacity.

In the case of taste, then, the mutual dependence of bodily necessities and the gratification of the sense is very marked; and a consideration of the whole circumstances connected with this sense has been used as an argument in favour of the unity of the creation and of the omniscience of the Creator; for we have, as essential conditions of the pleasure of eating, four distinct things, in no way necessarily connected with one another, except as they are *designed* to relate to each other. They are these:—The body, requiring aliment; the sense of taste, prompting to feed; wholesome food, fitted to maintain the body in well-being; peculiar, and often superadded flavours, to tempt the sense. Putting these in the order in which they are related to one another, we have—food, flavour, pleasure, health. The distinct links in the chain are all wonderful, and to many minds the union proves a unity of design and a benevolence of purpose.

In treating of the objects which excite the sense of taste, we must draw attention to the distinction between taste proper and the alimentary sensation of relish. That these sensations are different, will appear from the consideration that many things which are very appetising, and in the eating of which there is great pleasure, have but little distinctive taste. Butter and animal flesh are good instances of this. The tip of the tongue applied to these would give but little indication of the presence of sapid bodies; but the succeeding parts of the organ and the mouth declare them very good. On the other hand, sweet and bitter principles are detected at once by the tip of the tongue, though they be entirely indifferent to the sense of relish. Alum is thus sweet to the sense of taste, but disgusting to the sense which we have called alimentary. The sense of taste proper, or the appreciation of what is sweet, bitter, sour, etc., is more connected with the intellect than the sense of what is savoury; and hence it is less dependent on the state of the body, and it leaves behind it a multitude of distinct ideas which can be held in the memory. Thus a person when suffering from sea-sickness can well discriminate between sugar and quinine; but he would be a very indifferent judge of the flavour of a beef-steak at such a time. The multitude of flavours which can be distinguished is truly remarkable; for not only does the apricot, plum, cherry, and apple each have a characteristic taste, though they all belong to the same order of plants, but a hundred varieties of apples all challenge recognition from this sense. The grape produces a thousand wines, each with a bouquet of its own, even though alcohol and water are the main constituents of them all, and that which causes the difference is so small in quantity, that the chemist often cannot separate it. Some sensations described as tastes are but little removed from those of touch; thus, the taste of nutgalls, called an astringent taste, and the fiery taste of alcohol, are probably caused by mechanical action on the outer skin. In the first case the forcible contraction of the parts occasions a roughness; and spirit will produce a burning sensation on any delicate part of the body

We have now to apply our experimental knowledge of the sensation derived through the tongue and mouth to the inquiry—How far do brutes participate in these sensations? In order to answer this question, we must observe the gestures and exhibitions of animation of animals while feeding on those substances whose tastes we are ourselves acquainted with. Observation seems to lead to the conclusion which we should naturally have arrived at from reasoning on the question. The conclusion is this, that the sensation which we have called the alimentary feeling, and which is of a more animal character, is enjoyed in a greater degree in the brute than in man, while the true gustatory sense, being more connected with the exercise of the mental powers of comparing and distinguishing, is certainly weaker in the lower animals.

Brutes may be roughly divided into two great divisions, the carnivora, or flesh-eaters, and the herbivora, or vegetable-eaters. The type of the first class is the tiger, or, to give a more familiar example, the cat; while the other is represented by the ox. In each of these the whole body seems to have been constructed in relation to the food. The tiger has jagged back teeth, and pointed side fangs which lock deeply into one another, but have no grinding surface. The jaws that wield these are short, strong, and can play only to and from one another. It can therefore grip and hold, but cannot chew. The stomach is small and intestines short, because flesh is very nutritious, and needs but little digestion. The fore limbs can move freely in all directions, and are furnished with claws to strike and seize. The ox has long jaws, rough but flat hind teeth, and a close-fitting row of front ones in the front of the lower jaw, playing on a pad in the upper, and the lower jaw can swing sideways and so grind the food. He can therefore clip and chew, but cannot grip.

This comparison might be carried into almost every detail of structure. We cannot, then, in speaking of the sense of taste in mammals, speak of the class as a whole, because the objects of the sense are so different in the two divisions of the class. It must not be supposed that this division of brutes is sharply drawn; for between the two types of tiger and ox, animals of every grade of intermediate structure are found. Moreover, the division is not a good one for the purposes of zoological classification; for though both the tiger and the Tasmanian devil eat flesh, and the kangaroo eats grass like the ox, yet even the tiger is more like the ox, and the Tasmanian devil more like the kangaroo, than are those animals when cross-coupled, as in the first sentence. Further, some brutes made on the flesh-eating type eat all kinds of vegetables, as the bear does; and others built on the plan of herb-eaters will eat flesh, as the pig will. In fact, the division is a false one when we are treating of the classification and structure of animals, but it is nevertheless a useful one when we are writing of their powers and functions. In other words it is a good *physiological* but a bad *anatomical* division. We have entered so far into the question, not only because it bears on our special subject, but also because it explains the term "physiology."

Of carnivorous animals it may be stated that the alimentary sense, which is associated not only with the tongue, but with the throat and palate, is keen and pleasurable in the extreme, while the other branch of the sense of taste is feeble. That which we call ravenous hunger in a dog or lion is not the uneasy feeling of privation which we associate with excessive hunger, but is an all-engrossing desire to gratify the sense of taste, and this is altogether distinct from a dainty appreciation of flavour.

These animals can endure privation from food for considerable periods without manifesting any signs of starvation; but the smell, sight, and, most of all, the partial taste of flesh, excite them to eager and even ferocious craving. Hence the popular notion of the dangerous nature of wild beasts which have once tasted blood is a true one. On the other hand, when the food is once obtained, it is torn to pieces, flung to the back of the mouth, and swallowed with a rapidity which altogether forbids the idea that these animals possess to any extent the faculty of discrimination in their tastes.

This view of the question is also borne out by an inspection of the tongue. In the illustration (Fig. 12) the reader will find a representation of a cat's tongue. This tongue is long, and has but few round papillæ; but it is covered with a dense pile of long, thin, pointed, overlapping projections (filiform papillæ), which are directed backwards, and towards the mid line. The circumvallate papillæ, again, are but four in number, two on each side. It is this pile of pointed papillæ which makes the cat's tongue feel rough when she licks. The covering of these papillæ is so dense, hard, and thick, when compared with that of our own, that we are justified in thinking them mechanical only in function; and yet they cover the whole tongue almost to the exclusion of the other kinds.

In the larger members of the cat family these pointed papillæ are quite like hard thorns or spines; and with them the lion, tiger, and leopard can rasp away the last adhering fragments of flesh and ligament from the bones. A patch of these papillæ from the leopard's tongue are represented in the engraving (Fig. 12). They are two-lobed and rounded, and have from their back part a single sharp spine running directly backward, and they are set in a very regular pattern, alternating in each row. On the summit of the leopard's tongue a number of papillæ were found without spines, as though worn off, or perhaps not developed, lest the palate should be injured by them.

In illustration of these remarks we may give an incident. A gentleman had reared a tame leopard from a cub, and having always fed it on bread, etc., the animal was very docile, and showed no sign of savageness. It was often caressed by its master, and returned the blandishments after its manner. While thus engaged, it one day took its master's hand into its mouth, and began to lick it gently, but owing to the roughness of the tongue it caused some blood to flow. The gentleman, no doubt feeling some pain, tried to withdraw his hand, but, to his surprise, the beast for the first time in its life began to growl. With great presence of mind the gentleman relented from his effort to release his hand, rang the bell, asked his servant for his loaded pistol, and then shot his now dangerous favourite through the head.

In herbivorous animals, while the sense is far less keen, so far as the alimentary sensation is concerned, we have no reason to suppose that the distinguishing gustatory sense is in any degree stronger.

The main mass of the food of the ruminants is insipid. Freshness is the strongest term that can be used to express its desirability. A large bulk is required for but a little nutriment. Thus we find the ox occupies a considerable number of its wakeful hours in grazing and chewing, and it feeds along the pasture, tearing up the grass with but little discrimination. It is true that a cow will avoid noxious or disagreeable plants when they grow in clumps; for a field otherwise closely cropped still presents long stalks of the common buttercup. It would seem, however, that this avoidance is rather due to instinct than to disgust. Many plants have very powerful bitter, sour, and astringent principles, and they are intimately mingled with the grass; yet, as we seldom see a cow eject the food from its mouth, we cannot suppose it to have any very delicate sense of taste. From the fact that oxen ruminate, we might suppose that they enjoy the sense of taste while chewing the cud. So doubtless they do in a minor degree; but the act by which the food is returned to the mouth is probably quite involuntary; and the lazy, dreamy way in which an ox ruminates contrasts strongly with the avidity with which a carnivorous animal feeds.

The tongue of a ruminant is very long and flexible. It is often twisted round the herbage to tear it up, or break it off; and the qualities which fit it for this use are manifested in the highest degree in the tongue of the giraffe. This animal can extend by the length of this member its already great powers of reaching high, and thus hook down the branches of the palm. Well might this animal suggest to Lamarck that its whole organism had been modified by a constant endeavour to reach higher and higher.

The position of the large walled-round papillæ is very various in different animals. The reader will have observed their position in the chimpanzee, in one long line of about twelve in number down the middle of the tongue, with a few scattered ones on each side. In the pig, otter, and seal, they have the V-shaped arrangement which they have in man, but are fewer in number. In the sheep they form a thick raised ridge on each side at the back of the tongue.

One of the most singular uses to which the tongue is put in this class is manifested by the ant-eaters, whose long slimy tongues are used to thrust into ants' nests, so that when they are retracted into their long tubular mouths the ants are carried with them, adhering to the mucus.

If this article had been headed "The Tongue," instead of "The Organ of Taste," we should have a long task before us to describe the various shapes of the organ in toads and reptiles, and also in snails and insects. The organ to which the word tongue has been applied has a wonderful diversity of form, and many interesting peculiarities; but in most cases its main office is to seize or to masticate the food, and the function of taste is subordinate to this.

In birds the tongue is almost as diversified in form as the beak; but it is usually cased in horn at its fore part, and there are only a few papillæ above the air-hole. In parrots it is fleshy; and these birds seem to have more of the sense of taste than most birds, for they will turn a lump of sugar or a nut about in their beaks for some time to test its qualities before eating it. It is certainly singular that birds, whose proper food is fruit, should be so little endowed with a sense to appreciate its delightful and delicate flavour; nevertheless, it seems as though the tongue were only applied to test the softness, and therefore the ripeness of the fruit. The tongue drawn to represent (Fig. 12) that of the fieldfare may be taken as the typical tongue of a bird. The small triangular tongue of the ostrich, supported on its slender arch of bone, is given because of its singular shape and shortness. The length of the tongue has but little relation to the length of the beak. Thus both the pelican and the toucan have enormous beaks; but the former has a tongue as short as that of the ostrich, while that of the latter is very long. The tongue of the woodpecker is a living harpoon.

In some reptiles there is evidence of a sense of taste, but it is doubtless inferior to that of higher animals. The tongue of the chameleon, given in the engraving (Fig. 12), is of a curious shape; and the mechanism by which it can be darted upon a luckless fly is elaborate and interesting; but its description would be out of place here. In the toad and frog the tongue grows as the tail drops off. It sprouts from the inside of the lower jaw, and grows backward, so that its bi-lobed end lies free in the mouth, and can be filliped forward out of that cavity. This is also rather an organ of prehension than of taste. But that a frog has some sense of taste may be easily shown by giving him the "dung-worm," so good as bait. This worm exudes a yellow fluid, and as the frog tastes this his efforts to free himself from his food are sometimes most comical to behold. The forked tongue of the snake is familiar to everyone. Its reiterated protrusion and vibration have led the vulgar to consider this action as a threat, and to believe that it is the sting of the animal. It, however, has no such function. It may have some power of tasting, but it is more probable that it is an organ of touch; for this creature, limbless and covered with hard scales, is greatly in need of a means of feeling outward objects.

Fishes' tongues have seldom any soft parts, and cannot therefore be organs of taste. They are not unfrequently furnished with teeth. In some fish a cushion of soft substance, well supplied with blood-vessels, is found on the roof of the mouth.

All the higher orders of mollusca have an organ to which the name of tongue has been given, and some authors have proposed to group together the head-walkers, belly-walkers, and wing-footed classes under one subdivision, calling them *odontophora*, or animals which have a tooth-bearing tongue. This organ in snails (gastropods) bears transverse rows of teeth arranged in complicated and beautiful patterns, and is sometimes so long as to be called the lingual ribbon. As it is often used to file away shells before devouring the animal contained within, its function must be considered as other than that of taste.

The bee licks up its honey with a very complex tongue; but as this member is composed entirely of a horny substance and stiff hairs, it cannot be used to taste the sweet compound elaborated by the flowers. An internal cavity to hold food during the time necessary to its digestion is so generally present in animals that it almost serves as a character whereby to cut them off from the vegetable kingdom. A prompting to fill this cavity is of course always associated with the organ; but whether that prompting is automatic, instinctive, or rational, it is difficult to say. A sense that may be pleasurable or painful seems to imply some power of reasoning to make it useful. A sense which is neither pleasurable nor painful may stir but a blind instinct. There is, however, a lower impulse to action than even this, in which both intelligence and sense may not be at all involved. When the contact of food causes the sea anemone to close its arms around it, and force them into its mouth, it is probable that sense is no link in the chain of causes of this act, but the whole process of ingestion is parallel to that part of the action of swallowing which takes place in us after the senses have done their work, and the throat seizes the morsel of food and carries it down to the stomach by an involuntary act. Automatic and consensual acts are often as violent as those prompted by desire and reason, so that eagerness in feeding is no infallible evidence of taste in the lower animals. We abstain, therefore, from describing those various and interesting organs which lie in such a relation to the entrance of the alimentary canal of snails, flies, bees, etc., as to have been called tongues, as though they were organs of sense.

SPANISH.—X.

(*Continued from p. 55.*)

DEFECTIVE VERBS.

DEFECTIVE VERBS are those which are not employed in all the tenses or persons.

1. *Soler*, to be accustomed, is irregular, and seldom used except in the following tenses:—

IND. *Present.* Suelo, sueles, suele; solemos, soleis, suelen.—*Imperfect.* Solía, solías, solía; solíamos, solíais, solían.

2. *Yacer*, to lie, is not often used in any other persons than the third persons singular and plural of the present indicative, chiefly at the beginning of epitaphs:—

IND. *Present.* ——, ——, yace; ——, ——, yacen.

3. *Podrir*, to rot, is seldom used except in the second person plural of the imperative, ***podrid;*** and the third person singular of the imperfect subjunctive, *podriría.*

When *podrir* is figuratively used in any other moods or tenses, it is to be conjugated irregularly in the same tenses and persons as *servir*, by changing the *o* of the verb-root into *u;* as, *pudriendo*, rotting.

IMPERSONAL VERBS.

Impersonal verbs (or unipersonal verbs) are those which are employed only in the third person singular, and having no subject, take *it* or *there* with them in English; as *llueve*, it rains; *tronará*, it will thunder; *nieve*, let it snow; *hay*, there is, or there are; *habrá*, there will be.

1. *Llover*, to rain, is thus conjugated impersonally:—

INF. *Past Participle.* Llovido.—*Gerund.* Lloviendo.

IND. *Present.* Llueve, *it rains.*—*Imperfect.* Llovía, *it was raining.*—*Perfect Definite.* Llovió, *it rained.*—*First Future.* Lloverá, *it will rain.*

2. *Lluera*, let it rain, is thus conjugated:—

SUB. *Present.* Llueva, *it may rain.*—*Imperfect.* Lloviera, *it would rain;* lloveria, *it should rain;* lloviese, *it might rain.*—*First Future.* Si lloviere, *if it should rain.*

All the impersonal verbs are conjugated like some of the verbs whose conjugation has been already given; thus, *llover*, it will be seen, is irregular, and is conjugated like *mover* in the third person singular of each tense.

Haber and *hacer* are often used as impersonal verbs, and are in such cases to be rendered in English by the tenses of the verb *to be*, as, *hay*, there is, or there are; *hace*, it is.

3. *Haber*, to be, used impersonally, is thus conjugated :—

INF. *Past Participle.* Habido.—*Gerund.* Habiendo, *there being.*

IND. *Present.* Hay, *or* ha, *there is*, or *there are.*—*Imperfect.* Había, *there was*, or *there were.*—*Perfect Definite.* Hubo, *there was*, or *there were.*—*First Future.* Habrá, *there will be.*

4. *Haya*, let there be, is thus conjugated :—

SUB. *Present.* Haya, *there may be.*—*Imperfect.* Hubiera, *there would be;* habría, *there should be;* hubiese, *there might be.*—*First Future.* Si hubiere, *if there should be.*

Hay, *habia*, and *hubo* are rendered in English sometimes in the singular and sometimes in the plural, according as a singular or plural noun follows: thus, *hay una muger que tiene calentura*, there is a woman who has a fever; *hay mugeres que no la tienen*, there are women who have it not.

Hacer, when employed impersonally, is to be rendered in English by the verb *to be*, as, *hace*, it is; *hacía*, it was; *hizo*, it was; *hará*, it will be; *haga*, it may be, etc.: thus, *hace frío*, it is cold; *hace mucho aire*, there is much wind; *hace luna*, there is a moon; *hace buen tiempo*, it is good weather; *hace diez meses que ella murió*, it is ten months since she died.

5. *Placer*, to please, is used impersonally in the following tenses only :—

IND. *Present.* Place, *it pleases.*—*Imperfect.* Placia, *it was pleasing.*—*Perfect Indefinite.* Plugo, *it pleased.*

SUB. *Present.* Plegue, *it may please.*—*Imperfect.* Plugiera, *it would please;* plugiese, *it might please.*—*First Future.* Si plugiere, *if it should please.*

The persons of *placer* in the subjunctive are used only in these expressions: *plegue*, *plugiere*, or *plugiese á Dios*, may it, should it, or might it please God; *si me plugiere*, if it should please me.

There are some verbs that can be used in all the persons of the tenses, and also, at times, impersonally, as, *es muy tarde*, it is very late; *es preciso*, it is necessary; *es menester*, there is necessity; *parece*, it seems; *conviene*, it suits; *basta*, it is sufficient.

REMARKS ON THE SYNTAX.

THE ARTICLE.

The definite article is to be used before all common nouns taken in a general sense, and in the whole extent of their signification; as—

El ódio levanta rencillas,	*Hatred excites strife.*
La caridad es paciente,	*Charity is patient.*
Los hombres son mortales,	*Men are mortal.*

If the noun be not taken in a general sense the article is not used; as—

Hace buen tiempo,	*It is good weather.*
Tiene envidia,	*He is envious.*

The definite article is used before proper names of countries, states, and days of the week; as—

La Fráncia es un hermoso país,	*France is a beautiful country.*
Juan volverá el Martes,	*John will return on Tuesday.*

The definite article is to be used before numerals indicating the day of the month or the hour of the day; as—

El seis de Enero,	*The sixth (six) of January.*
A las tres de la tarde,	*At three o'clock in (of) the afternoon.*

The definite article is used before nouns indicating the rank, office, profession, or titles of persons when they are spoken of (but not when they are addressed); as—

El General Brown es valiente,	*General Brown is brave.*
La Señora Tranor no es prudente,	*Mrs. Tranor is not prudent.*

The definite article (and not the indefinite, as in English) is used before nouns signifying a certain weight, measure, size, quantity, or number, when preceded by the price, and to specify time; as—

Á tres duros la libra,	*At three dollars a (the) pound.*
Á dos pesos la vara,	*At two dollars a yard.*
A razon de diez duros el mes,	*At (the) rate of ten dollars a (the) month.*

Instead of the definite article, the preposition *por* may be used after the price; thus, we can say, á tres duros la libra, *at three dollars the pound;* or, á tres duros por libra, *at three dollars per pound.*

The definite article is not used before a noun which denotes relationship or kindred of another noun, when a verb comes between them; as—

María es hermana de Juana,	*Mary is the sister of Jane.*
Pablo es hijo del juez,	*Paul is the son of the judge.*

The definite article is not used before proper names nor before nouns in apposition, when not employed in a definite or determinative sense; as—

Pablo, apóstol de los Gentiles,	*Paul, the Apostle of the Gentiles.*
Ellos pecaron al Señor, esperanza de sus padres,	*They sinned against the Lord, the hope of their fathers.*

The definite article is not used before numerical adjectives when they denote order or succession; as—

Tomo segundo, página sexta,	*Volume the second, page the sixth.*
Enrique octavo,	*Henry the Eighth.*

The cardinal numbers (and not the ordinal) are generally used when the number expressing the order or succession exceeds nine; thus, Cárlos doce, *Charles the Twelfth* (literally, *Charles Twelve*), and not Cárlos duodécimo; tomo trece, *volume thirteen*, and not tomo décimotercio, *volume thirteenth.*

The titles of books, essays, chapters, or extracts, and the names of periodicals, do not generally take the definite article before them (except when spoken of); as—

História de España,	*The History of Spain.*
Gaceta de Londres,	*The London Gazette.*

The indefinite article is not generally used when some portion of a thing only is meant, and when the adverb *no* is used in the sense of *not a* (that is, *not any*), or *no;* as—

Tiene calentura,	*He has a fever.*
Ella tiene idea de comer,	*She has an idea of eating (to eat).*
Juan hace ruido,	*John makes a noise.*

The indefinite article is not used before two nouns, one of which, being connected by a verb to the other, shows the nation, relationship, rank, office, profession, or vocation of the latter; as—

Juan es Frances,	*John is a Frenchman.*
Cárlos es impresor,	*Charles is a printer.*
Hulló en él padre y madre,	*He found in him a father and a mother.*

The indefinite article is not used before a noun in apposition with another; as—

Estéban, hombre lleno de fé,	*Stephen, a man full of faith.*

The indefinite article is not used in the title of a book, chapter, or essay; as—

Coleccion de los mejores autores Españoles,	*A collection of the best Spanish authors.*

The indefinite article is not used before a noun in an ejaculatory phrase; as—

¡ Que idea ! ¡ Que desgrácia !	*What an idea ! what a misfortune !*

The indefinite article is not used between an adjective and its noun; as—

Médio peso, *half a dollar.*	Tan hermosa hija, *so beautiful a daughter.*
En tal tiempo, *in such a time.*	

The indefinite article is not used before the words médio, *a half;* cien *or* ciento, *a hundred;* and mil, *a thousand;* as—

Cien hombres, *a hundred men.*	Dia y médio, *a day and a half.*

The indefinite article is not used after algo, *something*, or nada, *nothing*, followed by the preposition *de;* as—

Pedro tiene algo de poeta,	*Peter is something of a poet.*

The indefinite article can be used before (but not after) tal, *such;* as—

Tenemos un tal Pontifice,	*We have such a High Priest.*

The infinitive mood, being used in Spanish as a noun with a preposition before it, in the same manner that the present participle is in English, can take the masculine definite article before it; as—

El murmurar de las fuentes,	*The murmuring of the fountains.*
Al ver el árbol,	*On seeing the tree.*

The definite article is used before the adverbs mas, *more*, and ménos, *less*, to express the superlative degree of comparison; as—

María es la mas hermosa de las mugeres,	*Mary is the most beautiful of women.*

The article is generally to be repeated before nouns which immediately follow each other, especially if they do not agree in gender; as—

La prudencia y el valor del rey,	*The prudence and the valour of the king.*

The learner will find many exceptions to the above rule in the best Spanish writers. The article must always be repeated in such cases when each noun is designed to be emphatic. When the word todo, *all*, sums up the several nouns, the article is not generally used before any of the nouns; as—

Españoles, Franceses, Ingleses y Americanos, todos son mortales,	*Spaniards, Frenchmen, Englishmen, and Americans are all mortal.*

The article is omitted in Spanish, as in English, before nouns taken in a partitive sense; as—

El carpintero tiene dinero,	*The carpenter has money.*

THE NOUN.

AUGMENTATIVES, DIMINUTIVES, AND COMMON TITLES OF RESPECT.

Augmentative nouns are such as are increased in the extent of their signification by the terminations *-on, -ona, -azo, -aza, -ote.* Thus the words daga, *dagger;* cuchara, *spoon;* fraile, *friar;* gato, *cat;* manga, *sleeve;* muger, *woman;* frente, *forehead,* can be rendered augmentative: as, dagon, *large dagger;* cucharon, *large spoon,* i.e., *a ladle;* frailon, *fat friar;* gatazo, *large cat;* mangote, *large sleeve;* mujerona, *stout woman;* frentaza, *broad forehead.*

Diminutive nouns are such as are decreased in the signification of their primitives by the terminations *-ico, -ica, -ejo, -eja, -ito, -ita, -eto, -eta, -illo, -illa, -uelo, -uela.* Thus, fraile, *friar;* capilla, *chapel;* cuchara, *spoon;* batel, *boat,* can be rendered diminutive: as, frailecico, frailecito, frailezuelo, *a little friar;* capilleja, capillita, capilleta, *small chapel;* cucharica, cucharita, cuchareta, cucharillo, *small spoon;* batelico, batelejo, batelito, batelillo, *little boat.* The terminations *-uelo* generally and *-illo* sometimes, express contempt: as hombre, *man;* hombrezuelo or hombrecillo, *an insignificant or contemptible little fellow.*

Adjectives are also frequently found used in a diminutive sense: as, poco, *little;* poquillo, poquitico, poquito, *very little.*

There is also a kind of nouns composed of the name of some instrument or object and one of the terminations *-azo, -aza, -ada,* the compound word including in its meaning both the instrument and some effect produced by it: as, dardo, *a dart;*

dardada, *a blow given with a dart;* cuchara, *a spoon;* cucharazo, *a blow with a spoon;* pluma, *a pen;* plumada, *a dash or stroke with a pen;* mano, *the hand;* manotazo *or* manotado, *a blow with the hand;* aldaba, *a knocker;* aldabada, *a rap with the knocker;* and aldabazo, *a violent rap with the knocker.*

When a noun with a singular termination denotes several persons or things, it is called a *collective* noun, or noun of multitude: as, turba, *a crowd;* vacada, *a drove of cows.*

The ordinary titles of respect, corresponding to Mr. or Esq. in English, are in Spanish *Señor* and *Don;* and those corresponding to Madam and Mrs. are *Señora* and *Doña;* and Miss, *Señorita.* *Don* and *Doña* never take the article before them, and can be used before Christian names only. *Señor* and *Don* are often used together before the Christian name. A few examples will show the manner in which these words are used:—

El Señor Blake es Americano, *Mr. Blake is an American.*
Don Diego Ticknor, me alegro mucho de verle, *Mr. James Ticknor, I am very glad to see you.*
El Señor Ray; La Señora Ray, *Mr. Ray; Mrs. Ray.*
La Señorita Mason, *Miss Mason.*
Al Señor Don Diego Harper, *to James Harper, Esq.*
Los Señores Don Juan Millon y Don Pablo Surret, *Messrs. John Millon and Paul Surret.*
Da una silla a Doña Sarah Ray, *give a chair to Mrs. Sarah Ray*

The article is never used before these titles, except when the persons are spoken of; of course, when persons are addressed, the proper title only is used; as—

Buenas tardes tenga V. Señorita Wilson, *I wish you a good evening, Miss Wilson.*

Señor, señora, señorita, señores, señoras, señoritas, also are used for *sir, madam, miss, gentlemen, ladies, young ladies* respectively; as—

Buenos dias, señor, *good morning, sir.*
Buenas noches, señores, *good night, gentlemen.*

Señor and *señora* are used as an additional mark of respect before the name of a relative in such cases as the following:—

¿Cómo está su señor hermano? *how is your brother?*
¿Como está su señora madre? *how is your mother?*

THE ADJECTIVE.

AGREEMENT AND POSITION OF ADJECTIVES.

The adjective must always agree in gender and number with the noun to which it belongs; as—

El hombre sábio, *the wise man.*
La muger sábia, *the wise woman.*
Los hombres sábios, *the wise men.*
Las mugeres sábias, *the wise women.*

Participles used as adjectives agree in gender and number with the noun to which they belong; as—

El engañado rey, *the deluded king.*
La engañada reina, *the deluded queen.*
Las engañadas criadas, *the deluded female servants.*

An adjective does not agree with the gender of the title of a person, but with the gender of the person to whom it is applied; as—

Su majestad esta enfermo, *his majesty is ill.*
Su majestad esta enferma, *her majesty is ill.*

Nada, *nothing,* requires a masculine adjective; as—

Nada hay limpio, *There is nothing pure.*

Two or more nouns in the singular require the adjective which belongs to them to be in the plural, and if the nouns are of different genders, the adjective must be in the masculine; as—

Juana y María están calladas, *Jane and Mary are silent.*
Lucía y Carlos estan cansados, *Lucy and Charles are tired.*

When an adjective comes before or after two or more plural nouns of different genders, it must agree in gender with the noun nearest to it; as—

Buenos diccionários y gramaticas, *good dictionaries and grammars.*
Diccionários y gramaticas buenas, *good dictionaries and grammars.*

The Spanish Academy recommends that in cases in which an adjective is to be used with two or more nouns differing in gender and number, it would be better to use a different adjective of similar meaning for every noun, or an adjective which does not change its ending to form its feminine for the plural.

The material of which a thing is made, as well as the country in which it is made or produced, are seldom used as adjectives, but as a noun preceded by the preposition *de;* thus:—

Paño de lana, *woollen cloth.*
Cueros de Mejico, *Mexican hides.*
Hoja de plata, *silver leaf.*
Cerveza de Lóndres, *London beer.*

The profession or dignity of a person may be qualified by an adjective derived from the name of a nation, or by a noun preceded by the preposition as above; thus:—

General de España, *Spanish general (general of Spain).*
General mejicano, *Mexican general.*

The title of the chief ruler of a country is not qnalified by an adjective expressing the nation, but by the name of the country, preceded by the preposition; as—

El rey de España, *the king of Spain.*
La reina de Inglaterra, *the queen of England.*
El presidente de los Estados Unidos, *the president of the United States.*

Adjectives of both numbers and genders are often used as nouns, being in such cases preceded by the article; as—

Un rico, *a rich (man).*
Una rica, *a rich (woman).*
Los doctos, *the learned.*
Los ricos, *the rich (men).*
Las ricas, *the rich (women).*

The neuter article (as it is called) *lo* precedes adjectives in the singular number, used as nouns, when taken in a general sense, without reference to either gender; as—

Lo escrito, *the written*, i.e., *that which is written.*
Lo malo, *the bad*, i.e., *that which is bad.*
Lo siguente, *the following*, i.e., *that which follows.*

Adjectives and participial adjectives are much oftener placed after the noun to which they belong than before it; as—

Hombre sábio, *a wise man.*
Furor poético, *poetical fury.*
Guárdia avanzada, *advanced guard.*

In many cases it is left entirely to the taste of the writer to place the adjective before or after the noun to which it belongs. But cardinal numbers, adjectives expressing some inherent or peculiar property, habit, or practice of the noun to which they belong, and adjectives employed as particular epithets with a proper name, are generally placed before the noun: so likewise adjectives accented on the antepenult; as in these examples:—

Una dulce frescura, *a pleasant coolness.*
Cristalina agua, *crystalline water.*
La blanca nieve, *the white snow.*
La tímida oveja, *the timid sheep*
El ambicioso Jefferson, *the ambitious Jefferson.*

The above rule is liable to many exceptions. Indeed, no certain rules can be given for the position of adjectives. Attention on the part of the pupil to the practice of the best Castilian writers will prove the best means of teaching him the most proper arrangement for adjectives.

Tanto, *as much*; cuanto, *so much*: mucho, *much*; todo, *all*; poco, *little*, are always placed before the noun.

In some few cases the same adjective has a different meaning according as it is placed before or after the noun; as—

Cuenta cierta, *a true (certain) narrative.*
Cierta señora, *a certain lady.*

COMPARATIVES AND SUPERLATIVES, ETC.

There are some irregular comparatives, as mayor, *greater*; mejor, *better*; menor, *smaller*; peor, *worse.*

As the superlative relative is formed by placing the article before the comparative, of course, el mayor means *the greatest*; el mejor, *the best*; el menor, *the least*; el peor, *the worst.*

There are some irregular superlatives, as máximo, *greatest*; óptimo, *best*; mínimo, *least*; pésimo, *worst*; ínfimo, *lowest.*

There are some superlatives in *-ísimo* not regularly formed, as bonísimo, *very good*; novísimo, *very new*; fortísimo, *very strong*; fidelísimo, *very faithful*; sapientísimo, *very wise*: these being the superlatives of the adjectives *bueno, nuevo, fuerte, fiel, sábio.*

There are a few superlatives otherwise irregular, as paupérrimo, *very poor*; misérrimo, *very miserable*; integérrimo, *very honest*; celebérrimo, *very celebrated*; salubérrimo, *very salubrious*; libérrimo, *very free.*

The superlative of the above adjectives can also be formed with *muy*, as muy grande, *very great*; muy pobre, *very poor*; muy bueno, *very good*, etc. And such as do not already end in *-ísimo* or *-érrimo* can have their regular form in *-ísimo*, as malísimo, *very bad*; poquísimo, *very small*, etc.

With political or other titles of dignity, *muy* before an adjective expresses somewhat less than the termination *-ísimo* affixed to it; thus, muy ilustre, *very illustrious*, is less than ilustrísimo, *most illustrious.*

When a superlative relative follows the noun to which it refers, it is sufficient that the article be used before the noun, and not repeated before the superlative; as—

Los Catalanes son los pueblos mas industriosos de España, *The Catalans are the most industrious people of Spain.*

One noun can be compared with another in the same manner as adjectives; as—

Juan es mas niño que su nieto, *John is more (of a) child than his grandson.*

In forming a comparison, in affirmative sentences, *de* is used instead of *que* before an adjective of quantity or number, or before the pronouns *what* or *that which*, expressed or understood; as—

Juan tiene mas de lo que necesita, *John has more than what he needs.*
Mi hijo tiene mas de seis años, *my son is more than six years old.*

If the sentence be negative, *de* or *que* may either of them be used before an adjective of quantity or number, or the pronouns *what* or *that which*; as—

Mi hijo no tiene mas que (*or* de) seis años, *My son is not more than six years old.*

When the adjective is placed after a proper name as a distinguishing epithet, such as "Tarquin the Proud," the article precedes it in Spanish as in English; as—

Alexandro el Magno, *Alexander the Great.*
Guzman el Bueno, *Guzman the Good.*

Numeral adjectives of order form an exception to the above rule; as—

Francisco Primero, *Francis the First.*
Carlos Doce, *Charles the Twelfth.*

The preposition *de* is generally used after an adjective or participle which is followed by a noun expressive of the cause, manner, means, or instrument, and also after adjectives denoting distance; as—

Agudo de ingénio, *sharp in intellect.*
Apurado de médios, *exhausted in means.*
Ageno de verdad, *foreign to truth.*
Bajo de cuerpo, *low in stature.*
Boto de punto, *blunt at the point.*
Curtido del sol, *tanned by the sun.*

Sordo de un oido, *deaf with one ear.*
Palido de miedo, *pale with fear.*
Defectos comunes de su juventud, *faults common to his youth.*
Ancho de boca, *wide in the mouth* (*wide-mouthed*).
Angosto de manga, *narrow in the sleeve* (*narrow-sleeved*).

The preposition *in* after a superlative is to be rendered into Spanish by *de;* as—

Los mas sábios hombres del mundo,	*The wisest men in the world.*

Tanto, and not *tan*, is used before a noun in comparisons of equality; as—

María tiene tanta prudencia como Juana,	*Mary has as much prudence as Jane.*

NUMERALS.

The numeral adjectives are divided into *cardinal* and *ordinal*. The cardinal numerals express numbers, as, *one*, *two*, *three;* and the ordinal numerals express order or rank, as, *first*, *second*, *third*.

There are also some numeral nouns, such as the collective numbers, una docena, *a dozen;* una veintena, *a score;* and the fractional numbers, la mitad, *the half;* un cuarto, *a fourth*.

The following is a list of the cardinal and ordinal numeral adjectives:—

CARDINAL NUMBERS.	ORDINAL NUMBERS.
Uno, una, *one.*	Primero, *first.*
Dos, *two.*	Segundo, *second.*
Tres, *three.*	Tercero, *third.*
Cuatro, *four.*	Cuarto, *fourth.*
Cinco, *five.*	Quinto, *fifth.*
Seis, *six.*	Sexto *or* sesto, *sixth.*
Siete, *seven.*	Séptimo, *seventh.*
Ocho, *eight.*	Octavo, *eighth.*
Nueve, *nine.*	Noveno *or* nono, *ninth.*
Diez, *ten.*	Décimo, *tenth.*
Once, *eleven.*	Undécimo, *eleventh.*
Doce, *twelve.*	Duodecimo, *twelfth.*
Trece, *thirteen.*	Décimo tércio, *thirteenth.*
Catorce, *fourteen.*	Décimo cuarto, *fourteenth.*
Quince, *fifteen.*	Decimo quinto, *fifteenth.*
Diez y seis, *sixteen.*	Decimo sesto, *sixteenth,*
Diez y siete, *seventeen.*	Décimo séptimo, *seventeenth.*
Diez y ocho, *eighteen.*	Décimo octavo, *eighteenth.*
Diez y nueve, *nineteen.*	Décimo nono, *nineteenth.*
Veinte, *twenty.*	Vigésimo, *twentieth.*
Veinte y uno,* *twenty-one.*	Vigésimo primo, *twenty first.*
Veinte y dos, *twenty-two.*	Vigésimo segundo, *twenty-second.*
Veinte y tres, *twenty-three.*	Vigésimo tércio, *twenty-third.*
Veinte y cuatro, *twenty-four.*	Vigésimo cuarto, *twenty-fourth.*
Veinte y cinco, *twenty-five.*	Vigésimo quinto, *twenty-fifth.*
Veinte y seis, *twenty-six.*	Vigésimo sesto, *twenty-sixth.*
Veinte y siete, *twenty-seven.*	Vigésimo septimo, *twenty-seventh.*
Veinte y ocho, *twenty-eight.*	Vigésimo octavo, *twenty-eighth.*
Veinte y nueve, *twenty-nine.*	Vigésimo nono, *twenty-ninth.*
Treinta, *thirty.*	Trigésimo, *thirtieth.*
Cuarenta, *forty.*	Cuadragésimo, *fortieth.*
Cincuenta, *fifty.*	Quincuagésimo, *fiftieth.*
Sesenta, *sixty.*	Sexagésimo, *sixtieth.*
Setenta, *seventy.*	Septuagésimo, *seventieth.*
Ochenta, *eighty.*	Octogésimo, *eightieth.*
Noventa, *ninety.*	Nonagésimo, *ninetieth.*
Ciento, *a hundred.*	Centésimo, *hundredth.*
Docientos, *two hundred.*	Docentésimo, *two hundredth.*
Trecientos, *three hundred.*	Trecentésimo, *three hundredth.*
Cuatrocientos, *four hundred.*	Cuadragéntesimo, *four hundredth.*
Quincientos, *five hundred.*	Quingentésimo, *five hundredth.*
Seiscientos, *six hundred.*	Sexentésimo, *six hundredth.*
Setecientos, *seven hundred.*	Septengentésimo, *seven hundredth.*
Ochocientos, *eight hundred.*	Octogentésimo, *eight hundredth.*
Novecientos, *nine hundred.*	Nonagentésimo, *nine hundredth.*
Mil, *a thousand.*	Milésimo, *thousandth.*

KEY TO EXERCISES.

Ex. 34.—1. This woman is called Mary. 2. It is believed. 3. This wine is sold at three shillings a bottle. 4. You are deceived. 5. What books are used in that school? 6. The bottles will be filled with water. 7. All the city will be filled with smoke. 8. Here French is spoken. 9. The doors will be opened. 10. The houses are burned. 11. Here books are sold. 12. The prophecies are fulfilled. 13. This man is called Peter.

Ex. 35.—1. Aqui se habla el Frances. 2. Llamad, y se os abrirá. 3. Se dobla el clamor. 4. ¿Se usan plumas de oro? 5. Las botellas se llenarán de vino. 6. La casa se llenará de humo. 7. Se abrirán las puertas. 8. Se cumple la profecia. 9. Las casas se quemaron. 10. Se abrió el libro. 11. Este vino se vende á dos pesos la botella. 12. Se continuara la carta. 13. Se abrieron todas las puertas.

Ex. 36.—1. The father loves his sons. 2. The physician heals the sick. 3. We pardon our debtors. 4. God loves those who are good. 5. She fears the American. 6. The judge pardoned the man who robbed Peter's father. 7. My manservant slew his father. 8. I pardoned all my debtors. 9. Peter loves me like a brother. 10. We will visit the president to-night. 11. I will reward him who honours me.

Ex. 37.—1. Honoramos al juez. 2. Este juez no teme á Dios. 3. Yo perdono á mis deudores. 4. Llamaron á los pintores. 5. El medico sanará á muchos enfermos. 6. Robaron á la muger a quien recompensamos. 7. Honrad á vuestros padres. 8. Te amo como á un padre. 9. Las señoras recompensarán á sus criadas.

COMPARATIVE ANATOMY.—XII.

[*Continued from p.* 60.]

MOLLUSCA (*continued*).

GASTROPODA.

The alimentary canal commences with a mouth armed with hard parts. These are different in different creatures; but in all there is a fibrous plate, bearing teeth, placed on a cushion on the floor of the mouth. These teeth are usually directed backwards; sometimes the plate in which they are set is very long from front to back, the teeth being disposed in small cross rows set in parallel lines from one end of the plate to the other. This is more especially the case in the carnivorous sea-snails, in which it is associated with a long extensible proboscis. In the land and fresh-water gastropods belonging to the order Pulmonata, the number in a cross direction is very great, but the lingual ribbon is much shorter. This tooth-bearing ribbon is set on a muscular pad, which can move it backward and forward, so that the little flinty teeth act as a fine file. It is curious that these teeth are composed neither of horn nor shell ($CaCO_3$), but of silica (SiO_2) or flint. They are, of course, liable to be worn away; but the ribbon is formed from behind as fast as it wears away in front; and in some species a considerable length of it lies coiled up in a sac or pouch, which stretches away from the mouth, ready to supply the place of the continual wear and tear. A few examples of the pattern of the teeth are given in the engraving (Fig. 28), in which only one transverse row of three different species is given. The mouth is very muscular, and has on its front and upper wall a broad horny jaw, which is flat, with a cutting edge directed downward. It is of various shapes, and is often toothed on its lower edge. In some sea-snails the mouth-cavity is furnished with a long trunk, which can be unfolded from within, and used to grasp objects while they are played upon by the file-like tongue. Inside these trunks there is sometimes a toothed circle or collar of pointed fangs, which very much strengthen the hold that the creature has on its prey. It is singular that this tooth-bearing tongue is found universally, not only among the gastropods, but also among all the higher orders of the Mollusca, so that some classifiers have associated these together as the Odontophora, or tooth-bearers.

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* Sometimes found written as one word, as *veintiuno*, *vetinidos.*

All the land, and most of the fresh-water snails have lungs, and belong to the sub-class Pulmonata, while the sea-snails have gills, and belong to the other sub-classes. Thus we see repeated in the Mollusca the two different kinds of breathing-organs which are suited to aquatic and aërial life, which in the vertebrates are represented by the gills of fish and the lungs of the higher orders. From this we may infer that a gill is the necessary form of a water-breathing apparatus.

The central organ, which aids the circulation of the blood, is situated in the typical gastropods in the partition or *diaphragm*, as it is called, which lies between the breathing-chamber and the chamber containing the viscera. It is always at the hind part of this, and receives the blood from the gills, or central vessel of the lungs, into a chamber or auricle. From this it passes through a valve to the more muscular ventricle, and is driven by this into a vessel which almost immediately divides into two, one of which goes forward to the mouth and foot, and the other backward to the liver and all those organs which are situated in the recesses of the shell or hind cavity of the abdomen. The blood, thus distributed by vessels, is said to escape from them into the general cavity of the body, and thence enters by wide openings to the veins which convey it to the gills or lungs. In the case of the lung-breathers it enters the diaphragm from behind, and runs into two main vessels along the margins of this organ, and then sends off smaller vessels or sinuses towards the central vessel. In the Prosobranchiata the sexes are distinct; but in the Pulmonata and Opisthobranchiata the sexes are united in one individual, and the organs in the former are of very complicated and peculiar structure.

The front part of the mantle-fold, which covers in the breathing-chamber, is thickened into a collar, and this is the instrument for secreting the shell. The shape and foldings of this edge of the mantle give rise, in the process of growth, to all those beautiful shells whose variety of colours and shape must be known to the reader.

One of the characteristics of the gastropods is the immense amount of sticky mucus they are constantly exuding, which makes, in the land-slugs, a serious draught on their nutritive system. This is secreted by glands all over the skin, but also, in some species, by special larger glands on the back of the neck.

The nervous ganglia, though they consist of the same elements as in the lamellibranchs, are gathered together so as to form a ring round the throat, situated at the narrow part just behind the buccal mass. The muscular system is almost wholly confined to the skin, except that a broad muscle arising from the lower part of the body runs to the head, and slips of this muscular sheet also go up to the tentacles, so that the tubular tentacles and eye-stalks are pulled into the body at the same time as the head is withdrawn. In the common snail the eye-tentacles are the longest, and are set highest on the head, while the lower pair is simply tactile. In many sea-snails there is only one pair of tentacles, the ends of which are feelers, while the eyes are set on the sides or bases of these. The eyes themselves are not highly organised, being little more than a nerve expanded in front of a disc of black pigment, and placed behind a transparent cornea. Ear-sacs, with round ear-stones in them, are found in many Gastropoda.

CEPHALOPODA.

This last and highest class of the Mollusca differs from the rest in containing animals with far higher powers of locomotion and perception than any of the others. The different species are, it is true, often very uncouth and grotesque in appearance, but probably the grotesqueness is due to the fact that they seldom come under our notice.

The cephalopods are divided into two great divisions, called, according to the number of their gills, *Tetrabranchiata* and *Dibranchiata*. To the former belongs the pearly nautilus, whose shells are so commonly seen in naturalists' shops, but which belong to at most only two species of animals. All the rest of this once numerously represented sub-class are fossil. The ammonites of the secondary period all give indications that they belong to this division, and their variety of form and number—the number of individuals—which lived during that period is truly amazing. It is curious that, while all the ammonites have died out, the nautilus, which still exists, represents a genus which lived in the primary ages, long before the others came into existence. It is probable that no other genus, and certainly none so high in the animal scale, has had so prolonged an existence on our planet.

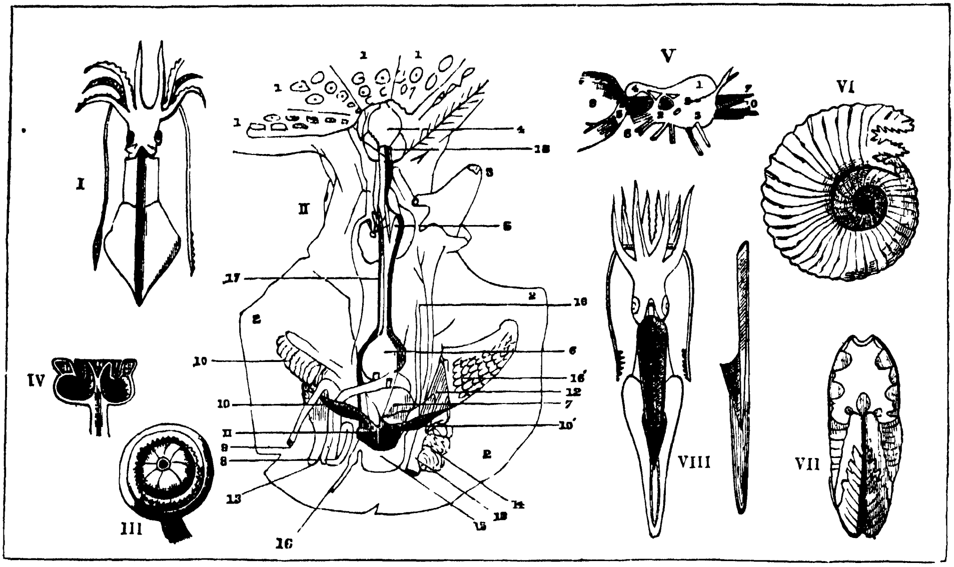

Fig. 85. Cephalopoda.—I. Loligo, a decapod Acetabuliferus genus. II. Octopus Vulgaris opened to show the arrangement of the organs III. Sucker from the Arm of a Sepia. IV. The same in section, to show the piston and the muscles which retract it. V. Side View of the Ganglionic Ring or Central Nervous System of Sepia. VI. Side View of an Imperfect Ammonite, showing the notched suture. VII. Front View of the same. VIII. Restored Belemnite and its Shell.

Refs. to Nos. in Figs.—II. 1, 1, 1, 1, roots of the arms, which are cut short; 2, 2, mantle thrown back; 3, funnel, or locomotive pipe; 4, buccal mass; 5, crop; 6, stomach; 7, blind sac opening into the stomach; 8, intestine; 9, arms; 10, 10', auricles; 11, ventricle; 12, gill heart (there are two of these, but the left is concealed); 13, 13, venæ cavæ—veins leading direct to the branchial hearts; 14, spongy masses round venæ cavæ supposed to be kidneys; 15, ovary; 16, 16', oviduct; 17, ascending aorta, or main trunk. V. 1, supra-œsophageal ganglion; 2, sub-œsophageal ganglion (anterior); 3, ditto (posterior); 4, 5, upper and under mouth ganglia; 6, nerves in arms; 7, ditto to mantle; 8, ditto to eye; 9, buccal mass; 10, throat.

VERTEBRATA.

The comparatively young study of embryology has already effected many changes in the classification of animals, but none more remarkable than the revolution it has effected in our idea of the contents of the group Vertebrata. The sea-squirts and their allies, the floating Salpæ and the beautiful Pyrosoma, in fact all the Ascidians or Tunicates, are shown to have had at some stage of their life the two characters which, in conjunction, distinguish vertebrates from all other animals. These are gill-slits at the sides of the neck and a central supporting axial rod or notochord. Some naturalists indeed speak of the group as Chordata, and divide them into:—

I. Cephalochordata for *Amphioxus*, when the notochord extends into the anterior end of the body (κεφαλή).

II. Urochordata for Tunicates, when the notochord is found only in the tail (οὐρα).

III. Vertebrata, when the notochord becomes surrounded by vertebral rings.

TUNICATA.

We will commence by the description of a simple animal, such as may be found adhering to the under side of a rock near low-water mark. The outer form is that of an Eastern leathern bottle, with a prominent mouth at one end; but it is unlike this bottle in that it has another opening on the side a little below the mouth. The mouth leads into a wide dilated throat, which occupies a large part of the centre of the bag-like animal, and is of a very peculiar structure. It has in its walls a series of slits which lead into a cavity directly communicating with the lower orifice. The slits are very numerous and small, and their edges are fringed with cilia which continually drive the water from the central throat to the atrial chamber, as the cavity is called. At the top of the throat is a circlet of tentacles which protrude into it, while at the bottom is an opening leading by a short œsophagus into a stomach, from which an intestine, twisted a few times, leads into the atrial chamber near its orifice. The remainder of the viscera, consisting of liver, heart, etc., are closely united with the stomach at the bottom part of the sac. From one end of the heart a vessel runs off, and is continued as a capacious channel along one side of the sac-like throat, while another channel along the opposite side runs to the viscera, and through them to the other end of the heart. The two channels above-mentioned communicate with one another by many transverse vessels, which branch in the membranous walls of the sac. Let us now consider the relation of these organs to the functions of respiration and alimentation. First, with regard to respiration. The cilia which fringe the slits are the prime movers of the water, by driving it from the inner sac into the chamber which surrounds it. This motion necessitates that a current should set *in* at the mouth, or end opening, and another *out* at the anal or side opening, and thus fresh water is constantly brought to the inner, or what may now be called the respiratory, sac. In the substance of this sac the blood is constantly changed by the motive power of the heart, which, though a simple tubular organ, contracts at one end first, and by the successive contraction of its circular fibres drives the blood to one of the channels, and thence through the tissue of the sac into the other, and so, by way of the viscera, into its other end. It is peculiar to these animals that the current is occasionally reversed. After working in one direction for some time the heart remains at rest, and then begins to propel the blood in the other direction. Next, in relation to food, it will be seen that the current will bring with it many of those little creatures which are so numerous in the waters of the sea. By some mysterious action, the cilia do not allow these particles of food to pass out by the slits, but propel them down towards the entrance to the stomach, and so onward. The excrement is, of course, passed out at the anal opening by the current. When any obnoxious substance is introduced by the current of water, it is felt by the tentacles which hang down inside the throat, and when this is the case the animal contracts the outer muscular coat so forcibly as to compress not only the atrial chamber, but also the respiratory sac, and so drives the water and the substance out again. This action has procured for the simple tunicate the name of the Sea Squirt.

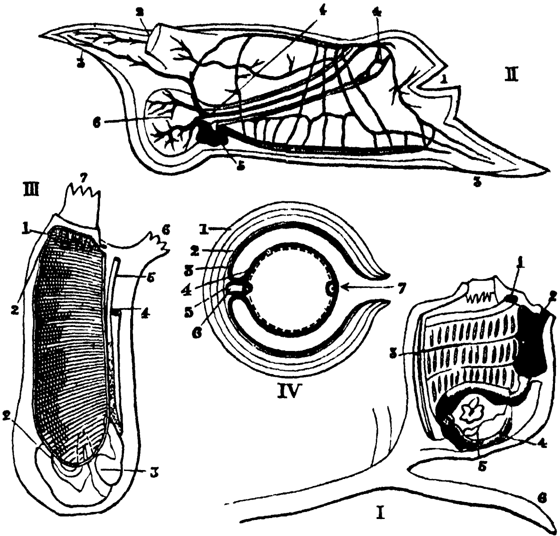

Fig. 36.—Tunicata.—I. Perophora Listeri. II. Salpa Maxima (one of a chain to show circulation). III. Diagram of a Solitary Tunicate. IV. Transverse section of a Solitary Tunicate.

Refs. to Nos. in Figs.—I. 1, nervous ganglion; 2, atrial chamber and outlet; 3, respiratory pharynx with its slits, 4, stomach; 5, portion of heart; 6, growing bud. II. 1, front opening; 2, hind ditto; 3, 3, places of attachment to chain of salpæ; 4, respiratory band; 5, heart; 6, mass
stomach; 4, anus; 5, oviduct; 6, anal opening; 7, oral opening. IV 1, test, or tunic; 2, muscular coat; 3, third tunic; 4, the same reflected on the pharynx; 5, perforated pharynx; 6, endostyle; 7, anus

Compound Tunicates do not differ much in structure from the simple ones, but they are connected together in some instances by a stalk, through which the blood is driven from zooid to zooid. This is the case in the family of the Clavellinidæ. In the family called Botryllidæ the separate zooids are only the products of a budding process, and though they are at first connected organically and always cohere, yet, when mature, the vascular connection is obliterated, and each feeds and respires for itself. In another family a multitude of zooids are united in a tube, one end of which is closed and the other open. All the mouths, or in-current orifices, of these are outside the tube, and all the ex-current orifices inside, so that the current of water which passes into the tube, being compelled to pass out at one end, drives the whole animal along; these creatures differing from the foregoing families in being free and locomotive. Another free and locomotive family is characterised by what is called an alternation of generations. In these a solitary individual gives birth by budding to a whole chain of zooids unlike itself, and united to one another end to end, not, indeed, organically, but by simple attachment. These have their in-current orifices at one end, with a valve attached to them, so as to prevent the water escaping outward. When, therefore, the body is contracted, the water is driven out at the other end, and so contributes to the onward motion of the chain. Across the respiratory sac there is a band or ribbon stretched, and this is the main instrument of respiration. One of these creatures (*i.e.*, one link of the chain) is represented in the engraving (Fig. 30, III.). Each zooid, or link, gives birth to one solitary form, unlike itself but like its mother, and so the so-called alternation of generations is completed. The production of the solitary Salpa is a true reproductive process corresponding to the rearing of a plant from seed, but the production of the chain is analogous to the growth of a branch from a leaf-bud.

VERTEBRATA.

The Vertebrata are an extensive series of animals, which, though occupying earth, air, and water, and possessing wide differences in their general form, habits, and degree of intelligence, have yet certain characters in common by which the naturalist is enabled to classify them. On the very boundary line of the two divisions there is a little being which forms the connecting link between them, by partaking of the characters of both: this is the lancelet (*Amphioxus lanceolatus*), so named from its lanceolate form. It is found in the European seas, especially the Mediterranean. Its respiratory or breathing apparatus is not unlike that of an ascidian; but it has a rudimentary spine and a spinal marrow, which are decidedly vertebrate. It is this spine or backbone which constitutes the principal feature in the basis of classification. Every animal in possession of a spine, however rudimentary or imperfect, must belong to this great division of Vertebrata. In proportion as the spine is found developed, so will be the other bones which complete the skeleton. Independently of these two characters, the Vertebrata are distinguished by a more highly organised breathing and circulatory apparatus. They possess a heart, and have red blood; they have a brain and spinal marrow; and a corresponding increase in the development of the emanating nerves. They are provided with sensory organs, such as those of hearing, sight, smell, taste, and touch. The anatomy of these several structures will be briefly reviewed under the respective subdivisions of the Vertebrata.

This grand division is subdivided into five great classes:—Fishes, Amphibia, Reptiles, Birds, and Mammals.

FISHES.

In accordance with the plan previously followed, we must begin our description with that class which presents the lowest organisation—namely, fishes. They are the most extensively distributed throughout the globe, and the most numerous and prolific of the whole division. Wherever water abounds, in the familiar pond, or in the rippling stream of a narrow brook, in lake or river, sea or ocean, there are floating tenants possessing an almost infinite variety of shape and size, from the little minnow to the huge shark. Man, the other extreme of the vertebrate kingdom, able to explore the waters at will, as he beholds the pond or lake whose gentle surface is scarcely ruffled, or the rugged waves of the mighty deep tossed to and fro in mountain masses, has begun to form some conception of the vast numbers of living beings situated beneath, listlessly enduring the one, or revelling delighted in the other. The great Pacific, with the lesser ocean the Atlantic, had been traversed by a living chain ages before adventurous and enterprising man first thought of connecting shore to shore by means of a submarine electric cable.

The student may form a bare idea of their numbers, when informed that in the herring fishery off Lowestoft, in 1854, nineteen millions were caught in that single season.

It will naturally be surmised from the circumstance of fishes being destined to live in so dense a medium as water, that their structure will indicate an especial adaptation to this kind of life. Their bodies present the shape which offers the least resistance to the opposing fluid, being smooth, more or less flattened, or rounded, and tapering from the middle towards either extremity. They have no neck, the head joining the trunk immediately.

The body is nearly of the same specific weight as the fluid in which it is immersed. Forming an ornamental protective covering to the surface of the body are numerous scales attached to folds of the skin, and overlapping each other by their free margins, like tiles on the roof of a house. These scales present a variety of shapes in different fishes; and also of consistence, from a mere membrane to a strong bony plate. Some fishes have no scales.

Fishes generally move by means of fins, which serve the place of limbs in higher animals. The two anterior and posterior correspond respectively to the fore and hind limbs. The anterior pair are called the pectoral fins. They are invariably situated on the breast, immediately behind the gills. Those situated on the belly are called ventral fins. The single fins are the dorsal (Fig. 37, III., 1, 2), the anal (4), and the tail or caudal fins (7). These fins are supported by filaments of more or less power and flexibility. The fins differ in their number and size, and also in the nature of the rays or filaments which support them. The pectoral or ventral, or both, may be absent; or there may be no fins at all.

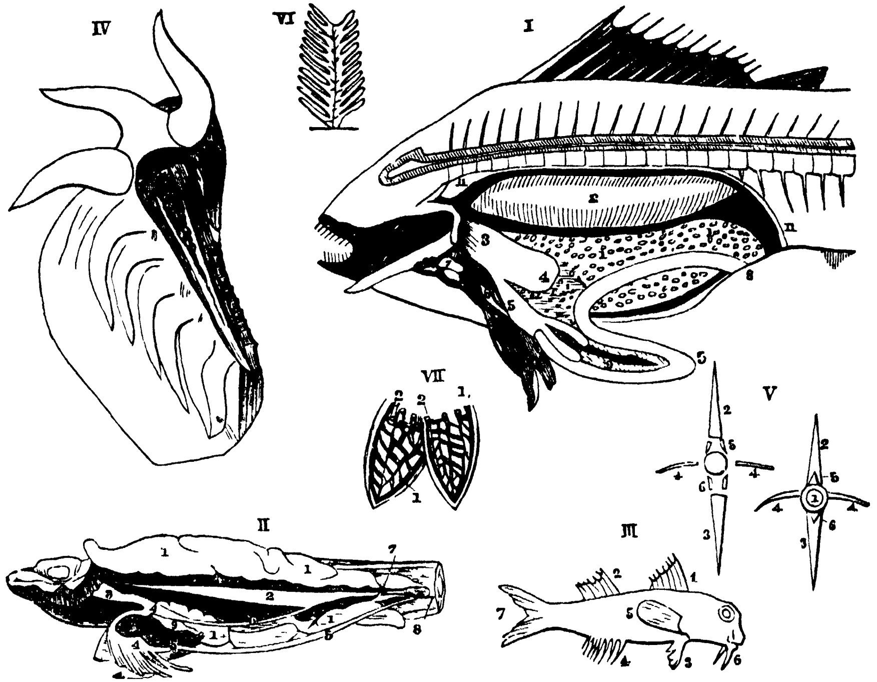

Fig 37.—I. Diagram of the general arrangement of the Viscera of a Fish. II. Diagram of arrangement of the Viscera of a Herring. III. Diagram showing the Fins of a Fish (after Knox). IV. Diagram showing the perpendicular position of the Upper Teeth, and the recumbent position of the Lower Teeth in the Jaws of the Shark. V. Vertebræ of a Fish (after Rymer Jones). VI. Diagram showing divided Gill of a Fish. VII. Capillary Network of a pair of Leaflets of the Gills of an Eel (after Carpenter).

Ref. to Nos. in Figs. I., II. 1, ovary; 2, air-bladder; 3, œsophagus or gullet; 4, stomach; 4′, pyloric cæca; 5, 5, intestine; 6, liver; 7, oviducts; 8, anus; 9, spleen; 10, heart; 11, kidney and urinary passage. III. 1, 2, the first and second dorsal fins; 3, ventral fin; 4, anal fin; 5, pectoral fin; 6, feelers; 7, caudal fin. V. 1, body or central piece; 2, spinous process; 3, inferior spinous process; 4, lateral or transverse processes; 5, nerve-processes and arch; 6, hæmal processes and arch; VII. 1, 1, branches of the branchial artery conveying venous blood; 2, 2, branches of the branchial vein returning aerated blood.

We must now briefly review the principal internal structures in the anatomy of the fish.

All fishes possess a more or less perfect skeleton, the chief element of which is the vertebral column. This occupies the axis of the body, and extends along its whole length. It is composed, not of one single piece, but of a number of segments connected together by means of a fibrous material. Each segment is made up of a number of parts.

The central piece (Fig. 37, V., 1) is named the body. It is shaped like an hour-glass, with the two extremities hollowed out into conical cavities, which sometimes communicate. Several processes project from the body. Above and below there are two small processes (5, 6), which soon unite together, enclosing arch-shaped spaces; afterwards continuing onwards as single processes. These are named respectively the upper and lower spinous processes. The upper arch lodges a portion of the spinal marrow; the lower, the large artery of the trunk. Besides these there are two other processes (4, 4), the lateral or transverse, which project from each side of the body. The use of these spines is to give attachment to muscles, and afford them leverage in producing the requisite movements in locomotion.

There are other little bones which spring from the ribs and vertebræ—often very numerous, as in the herring.

ELEMENTARY POLITICS.—I.

INTRODUCTION—THE STATE—DIFFERENT FORMS OF GOVERNMENTS.

We all have to hear a great deal about the political questions of the day. It is both our right and our duty to form opinions upon them. Most of us can do our part in deciding them. Every man in England, with very few exceptions, either has a vote or may expect to have it. Women cannot themselves vote in purely political matters; though in questions concerning local as distinct from central government a certain number of unmarried women are legally qualified to do so. But their influence on the votes of their fathers, brothers, husbands, sweethearts, may be immense. It is equally their duty, therefore, to form opinions for themselves, and to make sure as far as they can that those opinions are right.

It is, therefore, the business of all intelligent persons to try and take an interest in politics—to "take a side" in every election—if they can do so conscientiously, and to make up their mind according to the best information they have the time or opportunity to obtain.

Now, any sort of discussion on political topics usually before long implies some reference to general principles. If we are discussing, for instance, the question of further restrictions on the liquor traffic, we shall probably ask, For whose sake is it proposed to restrict the sale of liquor: for the sake of the people who drink too much, or of the other people who are annoyed and injured in various ways by the terrible evils of drunkenness? If the former, is it the business of the Government to look after grown men, who ought to be able to look after themselves? If the latter, how much annoyance does it take to justify interference? Both these alternatives raise a very important and very large general question—the proper relation of the Government to the individual and his rights.

Or if we discuss the question of a closer union between the Governments of the British Colonies and that of Great Britain and Ireland, usually called "the Federation of the Empire," the question at once arises, What are the general characteristics of the Federations we know, and can we apply them to the proposed union?

Many persons, again, hope that the Government will some day own all land and machinery, and direct all production. Some of them propose that the Government shall obtain it gradually, by putting on a high "succession duty" at the death of its present owners. Of course the objection is made, But this would interfere with the right of bequest, which is one of the "rights of property"; surely a man, having acquired property, may claim to leave it to his relations or friends.

Now each of these questions may raise a very lengthy discussion (1) as to the expediency, (2) as to the justice, of the measures proposed. With the expediency we are not here concerned. It can never be a matter of absolute certainty in any case which is the most expedient course to adopt. Nor when we come to practical proposals in politics can we be quite certain whether adherence to hard-and-fast rules of abstract justice may not do more harm than good—whether, in fact, the case in question may not be an exception to the rule. For we can never make a rule comprehensive enough to cover anything like the whole of the possible cases; but we can lay down rough general principles of politics and government, based on observation of history.

Our first question, then, may be, What do we understand by a State? And the best way of dealing with it will be to explain briefly how States have arisen in history.

The earliest form of society with which we need here concern ourselves is the village community (*see* lessons in Political Economy, Vol. VII., p. 209), a collection of households either related or supposed to be related by descent, cultivating land which is partly common property. It is true there are much more rudimentary forms of society, but their relation to the village community, the household and one another, is very obscure, and it is out of the village community that the State, properly speaking, arises. Let us suppose that instead of reading about village communities, we can visit one for ourselves. We shall find that it is usually governed by a Council of Elders, but beyond giving special orders (for the commencement of harvesting, for instance) and judging offenders, they have very little to do; for the life of the village is really regulated by the customs which have come down from past times. They have grown up gradually, perhaps are still growing, but the growth is not perceptible. Generally, the people of the villages are part of a tribe, and as such they go out to war and serve under their chief. War tends to strengthen the power of the chief: he gets a special share of any booty or conquered land; the warriors, in particular, support him; he extends his dominion; and so gradually military kingdoms grow up. But these kingdoms are not States, for this reason, that there is no regular legislative authority in them. The chiefs do not make laws. They issue special commands to their subjects, and demand services of them—contributions in men and money; but otherwise they let them alone. They do not propose, for instance, to alter their rules of inheritance, or their customs of marriage, or to interfere with their treatment of slaves or strangers. The subjects, on their part, worship their own gods, usually without interference, and never dream of altering their traditional customs. These forms of civil society, including the great Assyrian and Persian Empires of antiquity, have been called "tax-taking empires."

But in a few parts of the world a further development took place. Many tribes have hill-forts—temporary refuges for themselves and their cattle, should a stronger tribe ravage their country. We may see remains of such forts on some hill-tops in parts of England. In parts of Greece and in Southern Italy, these hill-forts became to some extent permanent abodes. Partly in Greece the change was connected with the introduction of new forms of worship which involved permanent temples, images, and other sacred objects; and these, of course, had to be kept out of the way of the enemy, because (the image being often confounded with the god) if they carried off the image, they would have the god too, and could doubtless induce him to favour them. Then the class specially charged with keeping up the worship went and lived near the temple. Moreover, Greece, in particular, is very mountainous; there is abundant building-stone everywhere, and a hill can generally be found which is tolerably defensible, and yet has a spring of water somewhere near its summit, because higher hills are not far off. So, instead of the village, with its slight buildings and shifting cultivation, we get a permanent city, able to stand a siege. And the country being much cut up by mountains, and nowhere very rich, it was not, like Egypt and Assyria, open to conquest. Great migrations there were in it, but these served rather to produce mixture of national types and to advance civilisation.

Moreover, the kingship, which was the product of warfare, soon died out in early Greece. The kings were not rich enough to keep up their retinue; the state was so small that it could be seen they were not abler than the rest of the great nobles. So we find the rule of the nobles substituted for that of the king. We find even a more important change. As commerce progresses, and new residents come in, the descendants of these residents try to obtain equal political rights with the old. Gradually they succeed. Monarchy, the rule (nominally) of one hereditary king, has given place to aristocracy—the rule of a privileged class. The word means "the rule of the best"; and it is tolerably certain that in very early times the ruling aristocracies of Greece were physically and intellectually the best part of society. As wealth grew up, other people obtained the means and the leisure to rise to an equality with the old citizens; then, too, the little wars in which these States are constantly engaged bring about a demand among the mass of the free population for a share of political power; so we reach democracy, the rule of the people in general.

These democracies were all confined to single cities with a total population varying from 2,000 or so to 400,000. They are marked by intense patriotism, combined unfortunately with bitter party spirit and personal hatred, which very frequently overpowered patriotic feeling. In all cases there was extreme jealousy of allowing power to any single person, and the bitterness of feeling between classes was so great that the States were almost always on the verge of revolution, and many of them constantly undergoing it. It was only when these little cities lost their political importance—when the great military monarchies of Philip of Macedon and his successors arose, which kept them quiet and practically held them in subjection—that they became comparatively tranquil. We must not, however, imagine that in these cities anything like the whole of the adult male population had any part in the government. Not only were there many slaves (in Athens four or five times as many as the citizens), but there were many foreign residents. The journeymen artisans were mostly slaves; the foreign residents had nearly all retail trade in their hands.

In Italy, however, one great city State, after passing through much the same order of constitutions as the Greek States described above, subjugated not only those States, but the rest of the civilised and much of the uncivilised world. But she did not incorporate these communities with herself, though she granted individual members of them membership of her own civic body, and sometimes did so to all the members of some one of them (Tarsus, the city of St. Paul, is a familiar instance). Her own political organisation was no longer adequate to govern her empire. Under republican forms, therefore, a single ruler was appointed, and though these forms were always more or less kept up, the office practically became hereditary, though the succession was very frequently interrupted. In theory, at the beginning of the Christian Era, the Roman Empire was primarily a collection of cities and their territory, Rome being the presiding city among them. Some of these cities had certain permanent rights of self-government, others governed themselves with a greater or less degree of liability to interference from the provincial governors sent out by Rome. Much of the territory held by Rome was regarded as too barbarous to be yet organised into self-governing communities, but cities were gradually founded in it. And the government of the whole body was vested in theory in the Roman people voting as one body (though soon after the Empire began this body ceased to meet), a senate or select council of them, practically appointed by the Emperor, and the Emperor himself, whose powers were ingeniously compounded out of those of the old civic magistrates, who continued however to exist in name by his side.

But the local governments for various reasons gradually became weakened, and the Emperor, with his trained staff of civil servants (the like of which had never existed before), got more and more control over them. So that about five centuries after Christ we find that the Roman Empire is conceived of as one great State with one personal ruler, on whom the people have conferred the power of making laws for the whole, and who is also supreme judge and supreme head of the executive power.

Now the Roman Empire fell—for many reasons; chief among them because it was invaded by more vigorous peoples, and because, being impoverished by a bad system of taxation, it had not the resources to resist them. These people (in the West) were organised very much as the earliest Greeks had been, and as the Macedonians were before they conquered Greece, in semi-feudal military monarchies. These had originally been organised in clans, some of which were supposed to be nobler than others, and in each of which there were several grades in rank, and a marked distinction between noble and non-noble families; and each clan had a hereditary chief who generally led it in war. But as clans and the tribes which composed them got more into the habit of combining for war, they took to electing regular leaders; and as the successful leader got special privileges and a special share of the booty and land captured, he gradually became wealthier than the rest of the people, and rose above them. Then his special friends or "companions" in war (known in the history of our own forefathers as *gesiths*) acquired a certain precedence from association with him and participation in his victories, and he rewarded them with grants of land and posts of honour in his household. And his leadership gradually became hereditary, and of course the more war there was the more the power of the commander-in-chief was strengthened. Moreover, as his dominions increased, he granted out parts of it to his "companions" to rule on condition of acknowledging their subjection to him, or "doing service," and sometimes no doubt neighbouring potentates who were not so strong staved off a war by accepting the same position. This holding of land on condition of service is the essence of feudalism; it is partly based on the land tenure of the primitive village community (*see* lessons in Political Economy, Vol. VII., p. 209), and partly on practices known to Roman law. These subordinates or vassals (also called "feudatories") made similar grants to their own "companions," and so we find a regular gradation throughout a feudal State from the king to the lords of manors.

Now this king was not despotic by any means. His feudatories had a great deal to say to his action. Indeed, he consulted some of them—the "wise men" of the nation—on all important steps; and the control of the action of the king and his "elders" or "wise men" ultimately rested with the assembly of all free men of the nation. But as most of these could not attend the assembly regularly, its control gradually declined. Moreover, his chief business was not to legislate or to carry out administration, but to conduct wars, and to judge or arbitrate between his subjects, more particularly his most powerful vassals. Moreover, by tradition. he could only tax his subjects with their express consent. In most Continental countries a custom grew up of calling together representatives of different classes of these subjects—the "Estates of the Realm," that is, the nobles, the clergy, and the commons—to grant supplies of money and deliberate on matters of importance. But these were generally summoned only when the king found it convenient. In England, when the misgovernment of Henry III. drove the nation to revolt, Simon de Montfort summoned the first Parliament, practically as a check on the king, and it soon divided into two Houses and sat more regularly than most Continental Parliaments. The clergy, too, retired from it to assemblies of their own, which survive in the "Convocations" of the provinces of Canterbury and York. Unlike the Continental assemblies, there was no sharp division into estates, because the bishops sat amongst the lords, and there was not (as on the Continent) a distinct order of nobility: the younger children of a peer are commoners. Indeed, the distinction of "estates" was so soon lost in England that men came to think (as some still think) that "the three Estates of the Realm" were King, Lords, and Commons. Moreover, there is much greater continuity between this Parliament and the earlier "assembly of wise men" and "assembly of freemen" than is traceable in most Continental kingdoms.

We find then that the old feudal monarchy in which the power of the king was limited by that of his chief vassals passes into the monarchy with estates or orders limiting the power of the crown, and with some form of representative government. But now (at any rate in England, France, Spain, and Scandinavia), another change took place. The kings strengthened their power at the expense of the nobles. In England this process was to a great extent brought about by the Wars of the Roses, in which many of the old noble families were extinguished. Moreover, lawyers had from quite early times applied to all kings doctrines that they found in the Roman law-books about the powers of the "Prince" or First Citizen, which was the chief title by which the Roman Emperor was known to his subjects. So we find it held that "what the Prince decides on has the force of law, because the people have transferred their power to him," and "all the land of the nation ultimately belongs to the Prince; the people have surrendered it to him and received it back as a sort of tenants." In Italy, too, writers like Macchiavelli familiarised the world with the notion that the ruler, simply in his own interest, might so organise the people through his officials as to increase its wealth and power to pay taxes, and so enable him to prevail over other States. Moreover, the attributes of the Kings of Israel and Judah were attributed by ecclesiastics to the kings of their day. One result of all this was the patriarchal theory of monarchy, which the Tudors and Stuarts attempted to carry out in England, and which was successfully put into practice in France, Spain, and some States of Germany. According to this all power was vested in the person at the head of the State, and he was bound to treat his subjects as a father treats his infant children—providing for their good without reference to their likes and dislikes. This theory in many Continental countries lasted on into the present century, and though in all of them except Russia the people have a very considerable share in the government, the view usually taken is, that the people have tacitly ceded their powers to the king, who has granted some of them back again, defining the grant and the way the powers are to be exercised in a written constitution. Several kings of European States granted constitutions after the overthrow of Napoleon in 1814, and revoked them a few years afterwards, but they have since been restored.

In England, patriarchal monarchy, which was never quite established, received its death-blow when James II. fled to France. The theory of "an original contract between king and people," which historically had not much more basis than the patriarchal theory, was applied to justify his deposition. The people, it was said, had contracted together to set up a Government to protect their lives, liberty, and property; and had contracted with the king, the head of the Government, to carry out their purposes. If he imprisoned or taxed them without due cause, he broke his contract and they might turn him out. So the throne was declared vacant and offered by Parliament to William of Orange, and the succession afterwards settled by Act of Parliament on the descendants of Sophia, granddaughter of James I., who had married the Elector (or reigning Prince) of Hanover, so that our present Royal Family hold their position by Act of Parliament.

Now it is to this patriarchal monarchy that we owe some of the leading features in our idea of the State. We conceive the State as a body of persons living on one territory—generally of considerable extent—and ruled over by a supreme authority (technically called the Sovereign), whose commands each member of the body is bound to obey. But we regard the supreme authority as consisting not of one individual, but of one or several groups of people, and we conceive that they derive their authority from the will of the bulk of the male adult population, or, at any rate, that they rule with its consent, whether formally expressed or tacitly understood. Here, the "social contract" theory has affected our views. And we regard it as carrying on its work by means of trained officials (technically called a bureaucracy), appointed by the head of the executive power, and as governing according to certain principles either expressed in the laws or generally understood. (Indeed, Sir Henry Maine has said with a good deal of truth that a modern democracy is very like a last-century monarchy upside down: there is the same sort of administration through trained officials, only the power of the machine is supposed to come from the people instead of the king. This, however, quite overlooks local government.) We shall return to these conceptions later. Here we may notice that they are all to be found in germ in the theories of the Roman lawyers before mentioned. The notion of the Sovereign is, to a great extent, derived from the absolute monarchies we have described. The first modern civil service was that of these monarchies; the notions of the multiple character of the Sovereign and of the constitution are partly suggested by English history, partly by the theories of a social contract, to which we have referred. We must, however, here notice the growth of popular government, or democracy.

When the English colonies in America separated from England, they established Republican governments, which may be concisely described as governments in which the power was ultimately derived from the bulk of the male population, and the members of the Government were elected by them for short terms. In structure these are very like the English constitutional monarchy, with written constitutions, and with elective heads substituted for kings. Shortly after the conclusion of the war, these joined together into a federal union, with a central Government, to which each State transferred certain of its powers (such as that of deciding on war, coining money, and levying customs duties), retaining the rest. These institutions were really derived, to a great extent, from England, modified, however, by the "social contract" theory and notions derived from the study of the democracies and of the one great federal union of antiquity, the Achæan League. In all cases they closely resembled the English constitution of that time, with an elective head put in the place of the hereditary king, and two houses of the legislature, both, however, elected by the people. But the suffrage was not by any means "manhood suffrage," but was dependent on a rather high property qualification and some length of residence. The makers of these constitutions were strongly impressed with a doctrine derived from the study of the English constitution—that the three great powers of government, the Legislative, the Executive, and the Judicial (that of law-making, that of carrying out the laws, and that of judging when the laws have been broken and, as far as possible, setting matters right again) should be confided to different sets of persons, as far as possible, and that one set should keep the other in check. Moreover, many of them were strongly impressed by their Puritan training with a belief in the natural depravity of man. So they contrived elaborate devices to limit and regulate the action of the various departments of government; and this system of "checks and balances" still marks the Constitution of the United States.

England at the end of the last century was held up to Continental nations by writers on political science as a model of freedom and good government. Though this was far from being the case absolutely, yet in comparison with all other great States of the time, there is no doubt that she was so. In England alone was there any approach to freedom of speech, or of the Press or of thought; Englishmen alone were free from arbitrary arrest or police interference; there was far less oppression of one class by another, far less severe or arbitrary taxation, than in any Continental State; and there was a system, though a very imperfect one, of representative government. After the overthrow of Napoleon, therefore, attempts were made to copy the chief features of the Constitution of England in various European countries; and it may be said that every existing monarchical constitution of Western Europe, and the present Constitution of Republican France, owes its leading features to the British Constitution.

One leading feature of this century, then, has generally been the introduction of constitutional monarchy. Another has been the general tendency towards the strengthening of the popular element in that monarchy; the mass of the people have gained very much in power, relatively to the rest of the State, in the last forty years, as the middle classes generally did in the thirty or forty years previous. Still another feature—far more important on the Continent than in England—has been the idea of nationality, which, as we usually find it, takes the form that all the people who speak one language are of one race, and ought to form one State. This idea dates from about the beginning of this century. It is to a great extent the product of the scientific study of language and history, which hardly began before that time; and it has been often applied mistakenly—for very frequently contiguous peoples of different races have come to speak the same language, and, though they have partially no doubt intermarried, have not by any means blended into one race. Many of the people in Eastern Prussia, for instance, speak German, but are Slavonic by descent. But a common language implies a common literature, and that involves community of ideas, and a much greater likeness in character and spirit than would otherwise be possible. The two great nations which have been united under one Government in this century are Germany and Italy. In each case the desire for political union has been kept up by the fact of there being one common language and literature.

It must be remembered, however, that there may be "nations" with a strong national feeling, but with no common language. There are four languages spoken in Switzerland, three of which may legally be used in the Parliamentary debates, yet the Swiss are intensely patriotic, and have not the slightest desire to break up and join France, Germany, or Italy respectively. It may be said that the spirit of nationality may arise from various causes—union under a popular Government may be one, community of language may be another; and the latter has been more generally important in the present century. But—since races are very mixed—we must be specially careful not to explain peculiarites of national character by reference to "blood" or "race." Probably certain types of character are liked in a nation, and imitated—just as they are in a school. That this may be possible there must be much intercourse, and for this a common language is all but indispensable.

COMMERCIAL CORRESPONDENCE.—IX.

[*Continued from p.* 78.]

48.—Form of English Charter-Party.*

London . . . .

It is this day mutually agreed between . . . . master of the good ship . . . . . of . . . . of the measurement of . . . . tons or thereabouts, now lying in the harbour of . . . . and . . . . & Co. of . . . . merchants; that the said ship being tight, staunch, and strong, and provided with a sufficient number of mariners, and every way fitted for the voyage, shall sail with the first fair wind and weather that shall happen after the . . . . next, from the said port of . . . . with the goods and merchandise of the said . . . . & Co. their factors and assigns, on board, to the port of . . . and there unlade and discharge the said goods and merchandise (the said ship shall then proceed forthwith to the port of . . . . or as near thereto as she may safely get, and there take on board a cargo of . . . . the property of the said . . . . & Co., their factors and assigns, and shall there return to the port of . . . . . with the said cargo) in the space of . . . . months, limited for the end of the said voyage, the act of God, the Queen's enemies, fire, and all and every other dangers and accidents of the seas, rivers, and navigation of whatever nature and kind soever excepted. In consideration whereof the said . . . . & Co. for themselves, their executors, and administrators, do hereby covenant and agree well and truly to pay or cause to be paid unto the said . . . . his executors, administrators, factors, or assigns, for the freight of the said ship and goods the sum of . . . . (or per ton . . . . one-half in cash on the delivery of the first cargo in the port of . . . . . and the remaining half in cash . . . . . days after the unloading and right delivery of the aforesaid cargo of . . . in the port of . . . .), and also shall and will pay for demurrage, if the said demurrage shall be by the default of the said . . . . & Co., the sum of . . . . per day.

In witness whereof we have set our hands and seals.

(L. S.) . . . . .
(L. S.) . . & Co.

49.—Form of French Charte-partie.

Londres . . . .

Je soussigné . . . . demeurant à . . . . capitaine et maitre après Dieu, du bâtiment . . . nommé . . . de . . . du port de . . . tonneaux ou environ, actuellement à . . . bien étanché, gréé, équipé, et en état de naviguer, reconnais avoir frété mon susdit bâtiment à vous Monsieur . . . . . aussi soussigné, négociant, demeurant à . . pour me rendre incessamment avec mon susdit bâtiment à . . . et y recevoir à mon bord, dans le temps ci-après stipulé, ma pleine et entière charge de . . . . et autres marchandises énoncées, par votre signature, pour, après avoir reçu mes expéditions définitives de la douane, et signé mes connaissements, et du premier temps convenable, partir, Dieu aidant, pour me rendre en droite route à . . . . lieu de ma destination et décharge et après mon heureuse arrivée au dit lieu, et avoir livré fidèlement les marchandises de mon chargement aux correspondants de l'affréteur, ou aux porteurs des connaissements (sauf les risques, perils et fortunes de la mer, dont Dieu nous garde), il me sera par eux payé comptant, ou au porteur de mes ordres, au lieu de ma décharge, pour mon fret, en espèces sonnantes, et non autrement, la somme de . . . . francs et . . . . francs de chapeau par chaque tonneau composé de mille kilogrammes.

Le capitaine sera libre de charger à bord de son navire . . . . . pour compte de son armateur, sans que pour cela l'affréteur puisse lui donner moins de . . . . kilogrammes ci-dessus spécifiés, s'ils lui sont nécessaires.

J'accorde . . . . jours courants de planche pour mon chargement, et . . . . jours courants pour mon déchargement.

Ce délai expiré, il me sera payé, en espèces sonnantes, la somme de . . . . francs par jour de retard, et ce, jour par jour, soit pour charger, soit pour décharger. Les avaries grosses (dont Dieu nous garde) seront réglées et payées suivant les us et coutumes de la mer, au lieu de ma décharge. Tous les frais et droits relatifs à la cargaison seront supportés par le sieur . . . . affréteur et consignataire; et ceux concernant le navire, par moi, capitaine. La cargaison sera mise à bord, et reprise de même aux frais et risques du sieur . . . . affréteur et consignataire.

Pour l'accomplissement des présentes clauses et conditions d'affrètement, les parties contractantes engagent mutuellement tous leurs biens présents et futurs, spécialement le sieur . . . . affréteur, la cargaison à charger ; et le capitaine, son navire, agrès et apparaux.

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* The student will note the difference between the English and French and German forms of the Charter-party. The latter are not mere translations of the former.

Aux susdites conventions, moi . . . affréteur soussigné, je promets de faire effectuer le chargement et déchargement sus-mentionné.

Fait et signé de bonne foi, sous les seings des parties et celui du courtier vers qui le présent original reste déposé, pour en délivrer expédition à qui de droit . . . . le treize . . . . mil huit cent . . . . La minute demeurée en nos mains est signée . . . .

Pour copie conforme
Courtier juré.

50.—FORM OF GERMAN CHARTE-PARTIE.

Charte-Partie

geſchloſſen durch Vermittelung . . . . . . zwiſchen
Herr . . . . als Befrachter einerſeits, und
Capitain . . . .
führend das . . . .
groß . . . . als Verfrachter andererſeits
auf folgende Bedingungen :

1. Capitain . . . . sein erwähntes Schiff in vollkommen ſeetüchtigem Stande, zu der beſtimmten Reiſe vollſtändig ausgerüſtet und bemannt, und mit gehörigen Papieren verſehen zur freien und alleinigen Dispoſition de Herr Befrachter , (die Kajüte und den nöthigen Raum für die Beſatzung und zur Bewahrung der Taue, Segel und Schiffs-Proviſion ausgenommen) und darf er für Niemand anders, ohne Zuſtimmung de ſelben, einige Güter laden, bei Verluſt der Fracht dafür.

2. D Herr Befrachter verpflichte ſich dagegen, das beſagte Schiff . . . . zu beladen, und ſegelt der Capitain ſogleich nach erhaltener Abfertigung mit erſtem günſtigen Winde und Wetter . . . .

3. Nach, Gott gebe, glücklicher Ankunft am Löſchplatze und nach guter und getreuer Lieferung der Ladung (jedoch haftet der Capitain für keine Seegefahr noch Seeſchaden), d Herr Befrachter verbunden, dem Capitain oder an deſſen Ordre die ſtipulirte Fracht . . . . prompt und unweigerlich zu bezahlen. Im Fall einer Avarie Extraordinaire wird dieſelbe nach See-Uſance regulirt und getragen.

4. . . . . . . Tage feſtgeſetzt, welche . . . . . . ihren Anfang nehmen, Tages hernach, wenn der Capitain zum . . . bereit ſich gemeldet. Würde er über die oben bemerkte Zeit aufgehalten, ſo ſollen ihm für jeden Überliegetag . . . . Tag für Tag vergütet und bezahlt werden.

5. Die Ladung wird dem Capitain . . . . koſtenfrei an Bord gebracht und . . . . wieder koſtenfrei abgeholt, wogegen derſelbe ſein Schiff an behörige Plätze legen muß, wie die Tiefe des Waſſers es erlaubt ; etwaige Leichterkoſten ſind für Rechnung de Herr Befrachter. Das Garnier liefert der Capitain.

6. Etwaige Schiffsunkoſten in . . . . (Avarie-Fälle ausgenommen) werden dem Capitain à Conto der Fracht franco Commiſſion und Zinſen gegen Bezahlung der Aſſecurranzſpeſen von Herr Befrachter Correſpondenten vorgeſchoſſen.

7. Der Capitain zeichnet die Connoſſemente in Bezug auf die Fracht wie ſie ihm vorgelegt werden, ohne weder Vortheil noch Nachtheil von dieſer Charte-Partie zu haben und valedirt die etwaige Mehr- oder Minderfracht für Rechnung de Herr Befrachter . . . .

8. An den Zollplätzen wird die Ladung durch d Herr Befrachter, und das Schiff von dem Capitain clarirt und verzollt.

Für die getreue Erfüllung dieſer Charte-Partie verpflichten ſich beiderſeitige Contrahenten mit ihrer Habe und Gütern, insbeſondere ſtellt der Capitain ſein Schiff mit Zubehör, ſowie d Herr Befrachter die ganze Ladung zum Pfande.

Von dieſer Charte-Partie . . . . . ausgefertigt und von den Contrahenten eigenhändig unterſchrieben.

So geſchehen . . . .

51.—ORDER FOR PAYMENT AT SIGHT.

5,000 Frs. *Marseilles, May 15th*, 1892.

At sight, pay to M. Chartier or order, the sum of Five Thousand Francs, as per advice of

LOUIS LEMAIRE.

Mr. Perrin, Merchant, Paris.

Bon pour Frs. 5,000.

Marseille, le 15 *mai*, 1892.

À vue, payez à M. Chartier, ou à son ordre, la somme de Cinq Mille Francs, valeur reçue, que vous passerez suivant l'avis de

LOUIS LEMAIRE.

À M. Perrin, négociant à Paris.

Marſeille, 15. Mai, 1892.

Bei Sicht zahlen Sie an Herrn Chartier oder Ordre die Summe von fünftauſend Franken, laut Avis von

fs. 5,000. Louis Lemaire.

Herrn Kaufmann Perrin, Paris.

52.—LETTER ENCLOSING INVOICE OF GOODS.

Gentlemen,—We beg leave to advise you of our having forwarded the goods ordered as follows :—

M . . . . . . cwt. . . . lb. gross weight, ... which please to receive, crediting us as per invoice here enclosed for the amount of . . . . (etc.) . . . .

For balancing this sum we have drawn on you at . . . . month date to the order of . . . . which please to accept.

Hoping that the goods sent will be to your full satisfaction, and trusting to be favoured with your further orders,

We are, Gentlemen,
Respectfully yours.

Messieurs,—Nous avons le plaisir de vous faire part de l'expédition des articles que vous avez bien voulu nous commander, savoir :

M . . . . quintaux . . . . livres . . . . poids brut . . . . qu'il vous plaira de recevoir pour nous en créditer le montant, selon la facture ci-incluse de (etc.) . . . . . .

Pour balance desdits objets nous avons disposé sur vous à . . . . . mois de date à l'ordre de . . . . . . auquel il vous plaira de préparer bon accueil.

Espérant que notre envoi sera à votre entière satisfaction et vous priant de nous continuer vos commandes,

Nous avons l'honneur d'être, Messieurs,

Vos obéissants Serviteurs.

Wir erlauben uns Ihnen mitzutheilen, daß wir ſolgende Waren an Ihre werthe Adreſſe Ihrem Auftrage entſprechend abgeſandt haben :

. . . . Kilos groß . . . . mit . . . . laut einliegender Factura zu unſeren Gunſten.

Zur Ausgleichung dieſes Betrages haben wir . . . . . Monate dato, Order . . . . auf Sie gezogen, und empfehlen unſere Entnahme Ihrem gütigen Schutze.

In der Hoffnung daß dieſe Waren Ihren vollen Beifall haben werden, ſehen wir Ihren weiteren Aufträgen gerne entgegen und zeichnen,

Hochachtungsvoll.

53.—Form of English Bottomry Bond.

Know all men by these presents that I . . . . master of the ship or vessel called the . . . . . of and belonging to the port of . . . . am held and firmly bounden unto . . . . of the town of Kingston-upon-Hull, merchant, in the sum of . . . . of lawful money of Great Britain and Ireland, to be paid to the said . . . . his executors, administrators, or assigns, or his or their lawful attorney or attorneys, for which payment to be well and truly made I bind myself, my heirs, executors, and administrators, goods, chattels, and effects firmly by these presents.

Dated at Kingston-upon-Hull aforesaid this . . . day of . . . in the year of our Lord . . .

Whereas the good ship or vessel called the . . . of Belfast, . . . of the burthen of . . . tons or thereabouts, whereof the above bounden . . . is master, is now about to sail from the port of Hull in the kingdom of England, laden with a cargo of . . . . and bound therewith to the port of . . . or so near as she can safely get thereto.

And whereas the above-named . . . merchant, hath advanced and lent unto the said . . . the sum of . . . to enable him, the said . . . . to pay the cost of certain repairs done to his said vessel, and other charges and expenses incurred by him at the said port of Hull, for and in respect of the said vessel, and also to enable him the said . . . . to prosecute his said voyage (as he the said . . . doth hereby admit and acknowledge, testified by his executing these presents), and the said . . . . hath agreed to stand and bear the hazard and adventure thereof on the hull and body of the said ship, her tackles, furnitures, apparel, and also on the said cargo laden on board the said ship, and the freight thereof upon the said intended voyage, which the said . . . hath and by these presents doth respectively assign over and mortgage unto the said . . . . . his heirs, executors, administrators, and assigns. And the said . . . doth declare that the said ship or vessel . . . . her tackle, furniture, and apparel, together with the said cargo and freight due and to become due in respect thereof, hath been and is thus assigned over and mortgaged unto the said . . . his executors, administrators, and assigns, for the security of the said . . . . and shall be delivered to no other use or purpose whatsoever until payment and full satisfaction of this Bond, together with the premium hereinafter mentioned, shall be made and complete.

Now the condition of the above-written obligation is such that if the said ship or vessel . . . . do and shall with all convenient speed proceed and sail from and out of the said port of Hull to the port of . . . . aforesaid, or so near thereto as she can safely get without deviation (damages and casualties of the seas excepted), and also if the above bounden . . . . his heirs, executors, or administrators, do and shall immediately after the said ship's arrival at . . . aforesaid, or so near thereto as she can safely get, well and truly pay or cause to be paid to the said . . . . his executors, administrators, or assigns, or his or their lawful attorney or attorneys, the sum of . . . of good and lawful money aforesaid, with . . . pounds and . . . shillings per cent. bottomry premium thereon, making together the sum of . . , or if in the said voyage and before the ship's arrival at . . . . aforesaid, or so near thereto as she could otherwise have safely got, an utter loss of the said ship by fire, enemies, or any other casualty, shall unavoidably happen, to be sufficiently proved by the said . . . his heirs, executors, or administrators, then the above-written Bond or obligation to be void, otherwise to be and remain in full force and virtue.

(The Captain's signature)

L. S.

Sealed and delivered in the presence of
N. N. (Notary)
N. N. (Witness)

54.—FORM OF FRENCH CONTRAT À LA GROSSE.

Je soussigné (capitaine) . . . . demeurant à . . . . capitaine du . . . (brig) . . . de la jauge de . . . . ayant . . . hommes d'équipage, tout compris, ayant relâché à . . . (Cherbourg) . . dans mon voyage de . . . . à . . . avec un chargement de . . . (bois de construction) . . . . pour ce dernier port, reconnais et confesse avoir reçu de Monsieur . . . négociant . . . . demeurant à . . . . en espèces et frais du présent acte la somme de . . . . à la grosse aventure de mer, pour servir au paiement de la réparation de mon dit navire et frais à la cargaison, de laquelle somme ledit sieur . . . . court les risques de mer et autres quelconques (sauf toute contribution aux avaries simples, dont il est dispensé) jusqu'à ce que je sois arrivé à . . . . où étant rendu, je promets et m'oblige de payer à l'ordre de . . . . la somme de . . . (emprunt et prime) . . . y compris l'intérêt de grosse, à cause desdits risques, lui affectant et hypothéquant, à cet effet, les marchandises composant ma cargaison, les corps, quille agrès, apparaux, dépendances et le fret de mon dit navire de même que tous mes biens présents et à venir, et même ma personne conformément aux lois et aux us et coutumes de la mer; en foi de quoi j'ai signé le présent double pour servir et ne valoir que d'un seul et même, à . . Cherbourg . . . le . . .

(Signature du Capitaine)

Capital (en chiffres)
Bénéfice (en id.)

55.—FORM OF GERMAN BODMEREI-BRIEF.

Ich Endesunterzeichneter, ... Kapitain des, ſeetüchtigen Schiffes . . . . , Tiefgang . . . Fuß, Bemannung . . . . , auf der Reiſe von . . . nach . . . begriffen, mit einer Ladung von . . . beſcheinige hiermit von . . . . in . . . die Summe von . . . empfangen zu haben zum Behufe nöthiger Reparaturen und Ladungsſpeſen. Genannter . . . übernimmt alle See- und anderen Riſicos (ausgenommen kleine Haverei) bis zu meiner Ankunft in . . . woſelbſt ich mich zur Zahlung von . . . . an . . . . verpflichte, in Erkennung genannter Riſicos, und habe ich hierzu meine Ladung, Schiff und Fracht, meinen Beſitz und meine Perſon dem Genannten . . . . . . verſchrieben—worüber dieſer Vertrag in zwei Exemplaren gezeichnet.

Unterſchrift des Kapitains . . .

ENGLISH LITERATURE.—XIV.

[*Continued from p.* 71.]

THE CIVIL WAR AND THE COMMONWEALTH: PROSE (*continued*).

SIR THOMAS BROWNE was a physician of eminence who practised at Norwich; he lived throughout the whole of the civil contests, and survived the Restoration by many years. His works are many and various, but they are all characterised by the same qualities, great and abstruse learning, extraordinary freshness and originality of thought, richness and quaintness of illustration, and great eloquence of language. They breathe a spirit of the profoundest piety, combined with the largest charity and tolerance. The tone of Browne's writings in this respect, as well as his peculiar style, may be well illustrated by a single passage from his most popular work, the "Religio Medici," a physician's religion. Speaking of Christians who differ from him, and especially of Roman Catholics, he says:—

> "I am not scrupulous to converse and live with them, to enter their churches in defect of ours, and pray either with them or for them. I could never perceive any rational consequence from those many texts which prohibit the children of Israel to pollute themselves with the temples of the heathens; we being all Christians, and not divided by such detested impieties as might profane our prayers, or the place wherein we make them; or that a resolved conscience may not adore her Creator anywhere, especially in places devoted to his service; where, if their devotions offend him, mine may please him; if theirs profane it, mine may hallow it. Holy water and crucifix —dangerous to the common people—deceive not my judgment, nor abuse my devotion at all I am, I confess, naturally inclined to that which misguided zeal terms superstition; my common conversation I do acknowledge austere; my behaviour full of rigour, sometimes not without morosity; yet, at my devotions, I love to use the civility of my knee, my hat, and my hand, with all those sensible motions which may express or promote my invisible devotion. I should violate my own arm rather than a church; nor willingly deface the name of saint or martyr. At the sight of a cross or a crucifix I can dispense with my hat, but scarce with the thought or memory of my Saviour; I cannot laugh at, but rather pity, the fruitless journeys of pilgrims, or contemn the miserable condition of friars; for, though misplaced in circumstances, there is something in it of devotion. I could never hear the Ave-Mary bell without an elevation, or think it a sufficient warrant, because they erred in one circumstance, for me to err in all—that is, in silence and dumb contempt. Whilst, therefore, they directed their devotions to her, I offered mine to God, and rectified the errors of their prayers by rightly ordering mine own. At a solemn procession I have wept abundantly, while my consorts, blind with opposition and prejudice, have fallen into an excess of scorn and laughter. There are, questionless, both in Greek, Roman, and African churches, solemnities and ceremonies whereof the wiser zeals do make a Christian use; and which stand condemned by us, not as evil in themselves, but as allurements and baits of superstition to those vulgar heads which look asquint on the face of truth, and those unstable judgments that cannot consist in the narrow point and centre of virtue without a reel or stagger to the circumference."

Next to "Religio Medici," the most popular of

Sir Thomas Browne's works are his "Pseudodoxia Epidemica," or Inquiries into Vulgar and Common Errors, and his "Hydriotaphia," or Treatise of Urn Burial.

Thomas Fuller was a clergyman, and followed the fortunes of the Royalist party and the Royalist army during the civil war, in which he served as a chaplain. He died immediately after the Restoration. Of his many works, the most generally known are his "Worthies of England and Wales," his "Church History," and his "Holy War," a history of the Crusades. They are full of the most varied learning, and the most striking originality, both of thought and expression, and sparkling with a quaint humour peculiar to the author.

Of all the great writers of the age of which we are now speaking, probably none produced so wide or so lasting an impression on the thoughts of men as Hobbes. Thomas Hobbes was born at Malmsbury, in Wiltshire, in 1588, being the son of a clergyman of that place. Having completed his university career at Magdalen Hall, Oxford, he became a tutor in the family of the Earl of Devonshire; and for many years he remained, in various capacities, a member of that nobleman's household. He associated on terms of friendship with most of the leading men of the Royalist party, and was well known and esteemed by the most eminent philosophers and men of science on the Continent as well as in England. His works in Latin and in English are very numerous. They include treatises on various branches of natural philosophy, but they chiefly treat of metaphysical and ethical philosophy, and the application of those sciences to politics and government. In philosophy Hobbes was a strict materialist; in morals, a utilitarian in the narrowest sense of the term; in politics, a strong supporter of monarchical power, and an unqualified enemy of popular liberty. His first English work, a translation of the History of Thucydides, is said to have been published with a view to warn men by example of the dangers of civil disunion. His most famous work, the "Leviathan," is an elaborate argument for the necessity of a strong monarchy to control men, whom, according to Hobbes's view, nothing but force can restrain. The last of his works, "Behemoth," which was not actually published till after his death, is a history of the Civil War, written in the kingly interest. Hobbes's style is a model of clearness and vigour. He died in 1679.

It must not be supposed that the very brief sketch which we have been able to give of the most eminent prose writers during the Civil War and the Commonwealth affords anything like a full view of the intellectual energy of the age. We have mentioned only those writers whose works are most important to the student of English literature generally. Many of the greatest men of that time, writing for the learned, wrote wholly in Latin, the language of the learned. Many, again, wrote upon subjects too special, too remote from ordinary interest, to fall within the scope of these lessons.

We have also passed by Milton, one of the greatest prose writers as well as the greatest poet of his age; his prose works we shall consider hereafter.

POETRY.

The period of the Civil War and the Commonwealth produced many poets; but, excepting always Milton, whom we shall have to treat of separately, they were neither very great individually, nor did they, like the second-rate poets and dramatists of the preceding generation, belong to a great school, writing under the influence of its principles and following its traditions. The period at which we have now arrived produced a class of poets distinguished rather by learning and subtlety than by truth or poetic feeling. To those poets Johnson gave the name of the metaphysical poets. The name is not very happily chosen, but it has been generally adopted by later writers; and Johnson's description of the characteristics of this class of writers, though a little exaggerated, is, if applied to the more extravagant examples of the class, in the main just:—"The metaphysical poets were men of learning, and to show their learning was their whole endeavour; but, unluckily resolving to show it in rhyme, instead of writing poetry, they only wrote verses, and very often such verses as stood the trial of the finger better than of the ear; for the modulation was so imperfect that they were only to be found verses by counting the syllables. If the father of criticism has rightly denominated poetry τέχνη μιμητική, an imitative art, those writers will, without great wrong, lose the name of poets; for they cannot be said to have imitated anything. They neither copied nature nor life; neither painted the forms of matter, nor represented the operations of intellect. . . . Their thoughts are often new, but seldom natural; they are not obvious, but neither are they just; and the reader, far from wondering that he missed them, wonders more frequently by what perverseness of industry they were ever found. . . . The most heterogeneous ideas are yoked by violence together; nature and art are ransacked for illustrations, comparisons, and allusions; their learning instructs, and their subtlety surprises; but the reader commonly thinks his improvement dearly bought, and though he sometimes admires, is seldom pleased. . . . From this account of their compositions it will be readily inferred that they were not successful in representing or moving the affections. . . . Nor was the sublime more within their reach than the pathetic. . . . Those writers who lay on the watch for novelty could have little hope of greatness, for great things cannot have escaped former observation. Their attempts were always analytic: they broke every image into fragments; and could no more represent, by their slender conceits and laboured particularities, the prospects of nature or the scenes of life, than he who dissects a sunbeam with a prism can exhibit the wide effulgence of a summer noon."

Bemerton Church.

The origin of this school of poetry in England is traced back by Johnson to Donne, whom we have already mentioned as a satirist among the poets of the Elizabethan age. The principal representative of the class in the following age was Cowley.

Abraham Cowley was born in London in 1618, his parents belonging to the tradesman class. He received his education at Westminster School and at Cambridge. From a very early age he gave proof of extraordinary intellectual vigour and great literary ability, and laid the foundation of the high reputation which he enjoyed among his contemporaries. Throughout the civil contests and the Commonwealth, Cowley warmly espoused the side of the King, and was for many years employed in responsible posts at home and abroad by the royal family. After the Restoration he, like many other faithful adherents of royalty, failed to obtain the reward of his devotion; and he died in retirement and disappointment in 1667. Of poets whose fame while living has been anything like so great as Cowley's there is probably hardly any whose works posterity has so completely forgotten as his. He was the author of a great number of short poems upon the most various subjects, and of very various degrees of merit, but all tainted more or less by the vices pointed out by Johnson in the passage we have quoted. The works of Cowley most admired by his contemporaries were his "Pindaric Odes," of which some are free translations of the ódes of Pindar, others original odes composed in a style which was once thought scarcely inferior to Pindar. But to a modern reader it is very difficult to detect their merit. "The Davideis" is an epic poem, intended to have extended to twelve books, but of which only four were completed, upon the life of David. It is said to have been written by Cowley when a very young man. There are few poems in the language so wholly wearisome, so destitute of life and interest, and so perpetually offending against every principle of good taste. As a prose writer, Cowley is far more pleasing than as a poet; his "Essays" upon various subjects of taste and criticism fully deserve the high reputation they have always enjoyed.

Among the minor poets of that age, there is probably none whose works have retained their popularity to the same degree as those of George Herbert. Where Cowley and even Waller have one reader, Herbert has hundreds. This lasting popularity he owes at least as much to the purity and beauty of his life and character as to his genius. Herbert was born in 1593; he was educated at Trinity College, Cambridge, and resided for some years at the university, where he filled the office of public orator, and was highly distinguished for learning and eloquence. But it was as a country clergyman, in the rectory of Bemerton, in Wilts, that he chiefly displayed those virtues which have secured him to so high a degree the reverence of successive generations of English churchmen. His poems are short religious pieces, and the principal series of them is one published after his death, under the title of "The Temple." They partake strongly of the prevailing faults of the day, affected conceits and misplaced ingenuity. But the spirit of profound piety, of ardent but chastened religious emotion which breathes through these poems, has given them a vitality which all their faults has not been able to destroy. Herbert died in 1633.

Somewhat similar in character to the poetry of Herbert is that of Richard Crashaw, a poet born a few years later than Herbert. Crashaw was educated at Oxford, but he soon became a Roman Catholic, and died at an early age an ecclesiastic in the Roman Catholic Church.

Francis Quarles is one of the writers most completely ruined by the prevailing taste of his day; his writings are to modern readers almost unbearable from their affectation and want of simplicity. A series of "Divine Emblems" is the best known of his works.

A poet of far superior quality to Quarles was George Wither. He was born towards the close of the reign of Elizabeth, and lived till several years after the Restoration. In all the contests of the stormy period in which his lot was cast Wither took an active part, and experienced the alternations of success and persecution which befell all such men. He was a staunch Puritan, and fought in the Parliamentary army. As a poet, Wither possessed many qualities of a very high order. When he writes at his best, his language is admirably terse and vigorous, his verse very melodious, and his observation both of external nature and of human nature close and delicate. But a great part of his poems are spoiled by the prevailing faults of his day, puerile conceits and ingenious extravagances both of thought and expression. There are some of his poems, however, which have wholly escaped the taint. What can be more simple and manly than the well-known song, from which space allows us to quote only two stanzas:—

"Shall I, wasting in despair,
Die because a woman's fair?
Or my cheeks make pale with care,
'Cause another's rosy are?
Be she fairer than the day,
Or the flowery meads in May—
  If she be not so to me,
  What care I how fair she be?

"Great or good, or kind or fair,
I shall ne'er the more despair.
If she love me, this believe.
I will die ere she shall grieve.
If she slight me when I woo,
I can scorn and let her go;
  For if she be not for me,
  What care I for whom she be?"

Robert Herrick was born before the close of the sixteenth century, and lived till some years after the Restoration. He was by profession a clergyman, and rector of a country parish; but in taste and sympathies he was a wit and man of the world. While showing strongly the faults of his age—sensuousness, subtlety, and want of simplicity—Herrick's poems also show in a peculiar degree the highest excellences of the period. For refinement of sentiment and grace of expression his songs are unsurpassed.

The peculiar beauties of the minor poetry of this period, though by no means wanting in some of those whom we have already mentioned, especially in Wither and Herrick, are chiefly to be found in the cavalier poets. These writers are all poets of romance rather than of passion. There is an air of lightness, almost of unreality, about their tenderest expressions; and they show a sensuousness of tone by no means in harmony with the sterner taste either of their Puritan contemporaries, or of more modern times; nor are they free from the tendency to morbid subtlety of thought and expression. But their lyrics have a grace, refinement, and delicacy of finish which no other school of English songwriters has ever reached, and which is irresistibly attractive. The principal representatives of this class are Suckling and Lovelace.

Sir John Suckling, who was born early in the reign of James I., and died in the midst of the conflicts of the next reign, was a cavalier, an ardent and devoted Royalist. His poems are all short, almost all of them on subjects of love and gallantry. Many of them are marred by an over-sensuous warmth of tone; but the best of them exhibit in a very high degree that delicacy of fancy and neatness of expression which are among the highest graces that such poetry can possess. The following lines from one of his best-known poems—that in which, under the guise and in the assumed style of a rustic, he describes a fashionable wedding, are a fair specimen of his style:—

"The maid, and hereby hangs a tale—
For such a maid no Whitsun ale
Could ever yet produce:
No grape that's hardly ripe could be
So round, so plump, so soft as she,
Nor half so full of juice.

EDMUND WALLER. *(From a Portrait by Kneller.)*

"Her finger was so small, the ring
Would not stay on which they did bring,
It was too wide a peck.
And, to say truth (for out it must),
It looked like the great collar (just)
About our young colt's neck.

"Her feet, beneath her petticoat,
Like little mice stole in and out,
As if they feared the light.
But, oh! she dances such a way!
No sun upon an Easter day
Is half so fine a sight."

Of all the song-writers of this period, perhaps the first place is due to Sir Richard Lovelace. He lived through the whole of the stormy period which included the Civil War and the Commonwealth. He was a soldier and a zealous loyalist, and fought on the King's side throughout the war; and in proportion as the King's cause declined the fortunes of Lovelace suffered with it. He was reduced to poverty, was frequently imprisoned, and died at last in extreme distress, just too soon to see the tide of fortune turn, and the triumph of his party in the Restoration. Love and loyalty are his favourite themes, and his songs have an exquisite grace and tenderness. The following poem, "To Althea from Prison," is one of the most beautiful lyrics in our language:—

"When Love with unconfinéd wings
Hovers within my gates,
And my divine Althea brings
To whisper at the grates;
When I lie tangled in her hair,
And fettered to her eye,
The birds that wanton in the air
Know no such liberty.

When flowing cups run swiftly round,
With no allaying Thames,
Our careless heads with roses crowned,
Our hearts with loyal flames;
When thirsty grief in wine we steep,
When healths and draughts go free—
Fishes that tipple in the deep
Know no such liberty.

"When, like committed linnets, I
With shriller throat shall sing
The sweetness, mercy, majesty,
And glories of my king;
When I shall voice aloud how good
He is, how great should be,
Enlargéd winds, that curl the flood,
Know no such liberty.

"Stone walls do not a prison make,
Nor iron bars a cage;
Minds innocent and quiet take
That for an hermitage.
If I have freedom in my love,
And in my soul am free,
Angels alone, that soar above,
Enjoy such liberty."

And not less perfect is his little poem, "To Lucasta on Going to the Wars":—

"Tell me not, sweet, I am unkind,
That from the nunnery
Of thy chaste breast and quiet mind
To war and arms I fly.

"True a new mistress now I chase,
The first foe in the field;
And with a firmer faith embrace
A sword, a horse, a shield.

"Yet this inconstancy is such
As you too shall adore;
I could not love thee, dear, so much
Loved I not honour more."

To the same class of cavalier poets belongs Cleveland, a poet who, in his own day, enjoyed a higher reputation than either Suckling or Lovelace, though posterity has reversed this judgment. His chief powers were as a satirist.

Two poets in particular, Waller and Denham, are exempted by Johnson from the catalogue of metaphysical poets. They, he says, "sought another way to fame, by improving the harmony of our numbers"; and although, in the case of Waller, most modern critics might hesitate before acquitting him absolutely of the charge intended to be conveyed by the epithet metaphysical, there can be no doubt that both the poets named contributed largely to the improvement of English versification.

Edmund Waller was born in 1603, and lived till 1687. During this period he filled a prominent place in public affairs. By birth he was a country gentleman, and at an early age he inherited an ample fortune. He entered Parliament early, and his wit and eloquence soon acquired for him a popularity which he never lost; though, by his selfish and unscrupulous conduct, he forfeited the respect of all parties. As a near relation of Hampden and Cromwell, his family connections were on the side of the Parliament; but his sympathies, so far as he had any, seem to have been rather with the opposite party. On one occasion he suffered banishment and a pecuniary fine for being a party to a foolish and somewhat discreditable plot in favour of the King, and might have incurred a heavier penalty had he not escaped by a cowardly betrayal of his friends. He was, in fact, an unprincipled and time-serving politician, a bad specimen of what in the next generation would have been called a trimmer; and he panegyrised with equal zeal Charles I., Cromwell, and Charles II. As a poet, a wit, and a man of letters, he enjoyed an unrivalled fame in his own day; but his works are little read now, and deservedly so. His verses never jar upon the ear, and his ideas but rarely offend the taste; but he very seldom rises above the tamest mediocrity. The simplest and least ambitious among Waller's poems are to a modern reader the most pleasing. The following very graceful song to a rose is a very favourable specimen of his manner.—

BEACONSFIELD CHURCH (SHOWING WALLER'S MONUMENT)
(From a Photograph by Taunt & Sons Oxford.)

"Go, lovely rose!
Tell her that wastes her time and me,
That now she knows,
When I resemble her to thee,
How sweet and fair she seems to be.

"Tell her that's young,
And shuns to have her graces spied,
That hadst thou sprung
In deserts where no men abide,
Thou must have uncommended died.

"Small is the worth
Of beauty from the light retired:
Bid her come forth,
Suffer herself to be desired,
And not blush so to be admired.

"Then die! that she,
The common fate of all things rare,
May read in thee:
How small a space of time they share,
That are so wondrous sweet and fair."

Sir John Denham, whom Johnson, as we have seen, coupled with Waller as an improver of our numbers, was not a very voluminous writer. His best as well as most celebrated poem is "Cooper's Hill." It is the earliest of a class of poems which have since become extremely common—poems in honour of particular localities. The subject, "Cooper's Hill," is a spot of that name close to the Thames. Denham, in a manner varied, but always pleasing, describes the beauties of the place, and expresses the thoughts and recollections which it suggests. His style and versification are always melodious, and he sometimes rises to a high degree of elevation and dignity. One of the finest passages in the poem is that in which, after an eloquent description of the beauties and benefits of the Thames, and its character as a stream, he closes with the lines which have been so often quoted and commended from the days of Dryden downwards:—

> "Oh, could I flow like thee, and make thy stream
> My great example, as it is my theme!
> Though deep, yet clear: though gentle, yet not dull;
> Strong without rage, without o'erflowing full."

Two other poets, from among a large number of obscurer names, demand mention, though we can only mention them. William Browne was the author of a series of pastoral poems of much merit, published under the name of "Britannia's Pastorals." Sir William Davenant enjoyed great fame as a dramatist and a poet. His chief poem is a long narrative poem of heroic achievements, "Gondibert." In its author's day this poem was very popular, as we know from frequent allusions to it in contemporary writings. But it is now completely forgotten.

HEAT.—II.

[*Continued from p.* 84.]

PRACTICAL APPLICATIONS.

ADVANTAGE is frequently taken of the property which the metals possess of expanding with heat and contracting with cold. Some years ago the walls of a large building in Paris had bulged outwards considerably, so as to endanger the structure. A number of iron rods were accordingly taken and passed through the building from side to side, the ends passing outside through large face-plates, and being secured by nuts screwed on to them. When these were screwed up as far as possible, the alternate rods were expanded by being heated, and then the nuts could be screwed up further on them. As they cooled the walls were drawn together to a slight extent, and the same process was then repeated with the other rods; and in this way the walls were gradually brought to the perpendicular.

For a similar reason the tire is always made hot before being put on a wheel, and then as it cools it forces the different pieces more closely together, and renders the wheel much stronger. So, too, in the manufacture of Armstrong guns, the different coils are shrunk on; and in making boilers, the plates are riveted together with hot rivets. The contraction of the metal while cooling renders the joint in each case much more close and tight than it would otherwise be.

In large iron bridges, like that over the Menai Straits, or some of those across the Thames, the heat of the sun's rays is sufficient to curve and raise the bridge in the middle, producing often a greater deflection than the heaviest load does.

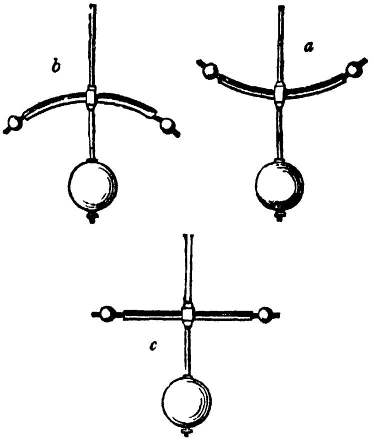


Fig. 10.

By reference to the table of expansions on page 84, it will be seen that some metals expand more than others for a similar increase of temperature. Hence, if thin bars of two different metals—as, for example, copper and iron—be taken, and riveted firmly together, and then exposed to an elevated temperature, the copper will expand more than the iron, and the bar will become curved, the iron being on the inner side. If, on the other hand, it be exposed to a lower temperature, the copper bar will become the shorter, and thus that will be the inner one in the curve. This fact is sometimes turned into account in the manufacture of compensating pendulums. As has been explained, any increase in the length of a pendulum makes it vibrate more slowly; hence, in hot weather, a chronometer would lose a little. To guard against this, different forms of compensating pendulum have been tried. One of these forms is represented in Fig. 10, *a*, *b*, *c*. A compound bar of copper and iron, with balls at each end, is fixed to the pendulum rod, the copper side of the bar being underneath, as that metal is more expansible. When the temperature falls, the pendulum rod contracts and raises the bob; the strip, however, curves downwards, as shown in the middle figure *b*, and thus the centre of gravity remains stationary. If the temperature rises, the strip curves upwards as at *a*, and thus the balls at the end of it rise and compensate for the increase in the length of the rod. A similar plan is adopted in the balance-wheels of the best watches.

Another application of the same principle is made in Breguet's metallic thermometer (Fig. 11). A compound ribbon is here twisted into a spiral, which is fixed to the stand at its upper end, and carries a needle below. This spiral coils or uncoils as the temperature changes, and the needle shows the readings on the graduated disc.

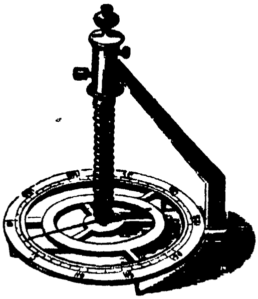
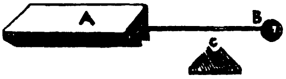


Fig. 11

HEAT CONVERTED INTO AUDIBLE MOTION.

There is one more experiment which must be described here, as it is a good illustration of expansion, and at the same time illustrates the conversion of heat into motion. The apparatus employed is known as the "rocker," or Trevelyan instrument, from the name of the gentleman who first constructed it. He had one day laid a hot soldering iron on a block of lead to cool, and was surprised soon after to hear a distinct sound given off by the iron. On investigation he found that it was thrown into rapid vibration, which caused the sound. The best form of rocker for trying the experiment is represented in Fig. 12. A piece of brass, A, is taken, about five inches long and an inch and a half wide. Its section is almost triangular, but a small groove is made along the apex, C, and a piece of wire terminating in a knob, B, is fixed in one end. Let the rocker now be raised to a high temperature, and then placed so that the knob, B, may rest upon a table, while the grooved edge of brass lies upon a block of lead. A succession of quick taps will be heard, and the rocker will be found to be in rapid vibration. By increasing the width of the groove, the vibrations may be rendered more and more rapid until a distinct musical note is obtained.



12.

The explanation of this is easily given. When the rocker is laid on the block a portion of one edge of it comes in actual contact with the lead. This metal, being very expansible, immediately throws out a small protuberance, and thus tilts the rocker, which therefore rests upon a fresh portion. This immediately expands in like manner, and in this way it is kept in rapid vibration, and produces the sound which is heard. The heat which the rocker possessed becomes slowly lost, being employed in heating the lead and in imparting motion to the brass, and this motion becomes in turn communicated to the air, manifesting itself in the form of sound.

EXPANSION OF LIQUIDS.

Thus far we have been concerned with the expansion of solids. We have now to see how liquids expand under the influence of heat, and in their case it is evidently the cubical and not the linear expansion with which we have to deal. As, however, the liquid must be contained in some vessel, and that vessel expands as well as the liquid, we must distinguish between the apparent and the real expansion of the liquid, the latter being the larger of the two by just the amount that the vessel is increased in capacity. Thus, let the liquid in the flask (Fig. 7, p. 83) stand at the level A, and when it is immersed in a jar of hot water let it rise to the level B; the apparent expansion is the quantity contained in the tube between A and B. If, however, the flask had retained exactly its original capacity, the liquid would have risen higher in the stem, showing that the real expansion is greater.

Liquids generally do not expand uniformly; the amount of expansion between 50° and 60° F., for example, would not be the same as that between 190° and 200° F. Mercury, however, is an exception to this rule, as between 32° and 212° F. it expands uniformly, and hence it is specially fitted for use in the construction of thermometers. The following table shows the apparent expansion in glass of several liquids when raised from 32° to 212° F.:—

Mercury . . .	$\frac{1}{64}$	Sulphuric Acid	$\frac{1}{17}$	Olive oil . . .	$\frac{1}{12}$
Water	$\frac{1}{23}$	Ether	$\frac{1}{14}$	Alcohol . . .	[illegible]

The way in which the *real* expansion of mercury is ascertained is by filling two vertical tubes A and B with it, and making them communicate by a small tube opening into their lower ends (Fig. 13). One tube is now surrounded by a jacket containing boiling water, while the other is surrounded by melting ice. The mercury in the hot one will stand at a higher level than that in the other. This difference is measured by a telescope K properly adjusted, and shows the real expansion.

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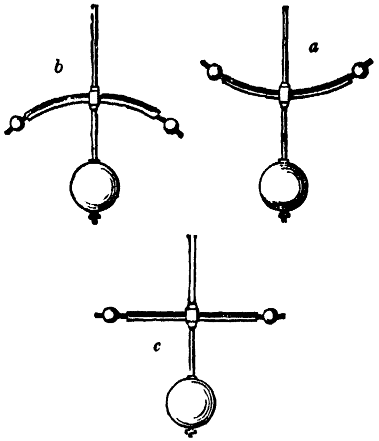

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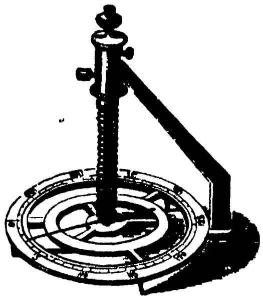

Fig. 11

HEAT CONVERTED INTO AUDIBLE MOTION.

There is one more experiment which must be described here, as it is a good illustration of expansion, and at the same time illustrates the conversion of heat into motion. The apparatus employed is known as the "rocker," or Trevelyan instrument, from the name of the gentleman who first constructed it. He had one day laid a hot soldering iron on a block of lead to cool, and was surprised soon after to hear a distinct sound given off by the iron. On investigation he found that it was thrown into rapid vibration, which caused the sound. The best form of rocker for trying the experiment is represented in Fig. 12. A piece of brass, A, is taken, about five inches long and an inch and a half wide. Its section is almost triangular, but a small groove is made along the apex, C, and a piece of wire terminating in a knob, B, is fixed in one end. Let the rocker now be raised to a high temperature, and then placed so that the knob, B, may rest upon a table, while the grooved edge of brass lies upon a block of lead. A succession of quick taps will be heard, and the rocker will be found to be in rapid vibration. By increasing the width of the groove, the vibrations may be rendered more and more rapid until a distinct musical note is obtained.

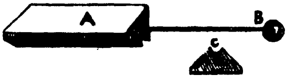

Fig. 12.

The explanation of this is easily given. When the rocker is laid on the block a portion of one edge of it comes in actual contact with the lead. This metal, being very expansible, immediately throws out a small protuberance, and thus tilts the rocker, which therefore rests upon a fresh portion. This immediately expands in like manner, and in this way it is kept in rapid vibration, and produces the sound which is heard. The heat which the rocker possessed becomes slowly lost, being employed in heating the lead and in imparting motion to the brass, and this motion becomes in turn communicated to the air, manifesting itself in the form of sound.

EXPANSION OF LIQUIDS.

Thus far we have been concerned with the expansion of solids. We have now to see how liquids expand under the influence of heat, and in their case it is evidently the cubical and not the linear expansion with which we have to deal. As, however, the liquid must be contained in some vessel, and that vessel expands as well as the liquid, we must distinguish between the apparent and the real expansion of the liquid, the latter being the larger of the two by just the amount that the vessel is increased in capacity. Thus, let the liquid in the flask (Fig. 7, p. 83) stand at the level A, and when it is immersed in a jar of hot water let it rise to the level B; the apparent expansion is the quantity contained in the tube between A and B. If, however, the flask had retained exactly its original capacity, the liquid would have risen higher in the stem, showing that the real expansion is greater.

Liquids generally do not expand uniformly; the amount of expansion between 50° and 60° F., for example, would not be the same as that between 190° and 200° F. Mercury, however, is an exception to this rule, as between 32° and 212° F. it expands uniformly, and hence it is specially fitted for use in the construction of thermometers. The following table shows the apparent expansion in glass of several liquids when raised from 32° to 212° F.:—

Mercury . . .	$\frac{1}{63}$	Sulphuric Acid	$\frac{1}{17}$	Olive oil . .	$\frac{1}{12}$
Water. . . .	$\frac{1}{22}$	Ether . . .	$\frac{1}{16}$	Alcohol . . .	$\frac{1}{9}$

The way in which the *real* expansion of mercury is ascertained is by filling two vertical tubes A and B with it, and making them communicate by a small tube opening into their lower ends (Fig. 13). One tube is now surrounded by a jacket containing boiling water, while the other is surrounded by melting ice. The mercury in the hot one will stand at a higher level than that in the other. This difference is measured by a telescope K properly adjusted, and shows the real expansion.

ANOMALOUS BEHAVIOUR OF WATER.

There is an interesting experiment in connection with the expansion of water which shows a departure from the general rule. Let a tall glass vessel be filled with water, with a small thermometer at the bottom of it, and a second near the top. Now put the whole in a place where the temperature is below the freezing-point; both thermometers will fall, the lower one, however, more rapidly than the other till it reaches about 40° F., when it will become stationary. The upper one will continue to fall down to 32° F., and then the water will begin to freeze, and the vessel will probably be cracked.

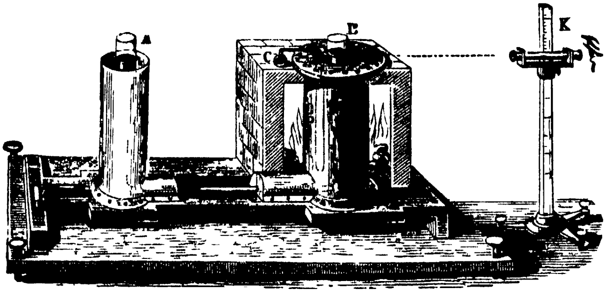

Fig. 13.

The explanation of this is found in the fact that at first the cooler water from the top and sides, being more dense, sinks to the bottom. When, however, water attains the temperature of 39·4° F., it has attained its maximum density, and then, instead of continuing to contract, it expands slightly till it reaches the freezing-point, when it suddenly expands still further. Thus, in the above experiment, the water at 39·4° was at its greatest density, and hence remained at the bottom. This provision is of great importance to us, as, were it not for it, the coldest water would sink to the bottoms of our seas and rivers till all attained a temperature of 32° F., and they would then be slowly converted into masses of solid ice, whereas now the colder water and ice on the top protects that below.

There are other bodies which behave in this anomalous manner, a notable example being that of iodide of silver.

The great expansion of water on becoming converted into ice is often so painfully manifested in the bursting of our waterpipes and plugs during a frost that it need not be illustrated further. It is well, however, to guard against the common error of supposing that it is the thaw which bursts them. The real fact is that the ice has done it, but it remains as a solid plug till the thaw comes; it then becomes melted, and the water at once flows out of the crack.

THE EXPANSION OF GASES.

The expansion of gases is much greater than that of either solids or liquids, being usually taken at $\frac{1}{492}$ of the volume at 32° F. for each *degree* Fahrenheit they are raised above that point (or $\frac{1}{273}$ of the volume for each degree Centigrade). This rate is very nearly the same for all gases, and is uniform for all temperatures, except the gas be near its point of condensation.

Advantage is taken of the great expansibility of air in the construction of the differential thermometer, which is used to measure very small amounts of heat. It consists of two large bulbs (Fig. 14) containing air, and connected by a tube, in which is placed a drop of coloured liquid to serve as an index. If now one of the bulbs be raised to a higher temperature than the other, the air in it will expand and drive the liquid nearer the other, the distance it moves being shown by means of a graduated scale. When both bulbs are exposed to the same temperature no effect is produced; it is only the difference that is shown, and hence its name of differential thermometer.

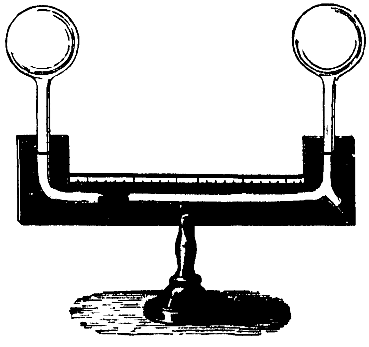

Fig. 14.

CHANGE OF STATE PRODUCED BY HEAT.

The next effect of heat we have to notice is that manifested in producing a change of state in different bodies. The three states of water—ice, water, steam—familiar to all, arise merely from alterations in the heat. Some substances do not fuse at all, but at high temperatures become decomposed; most organic substances belong to this class. Many bodies, however, fuse at moderate degrees of temperature, and we find the following laws respecting the point of fusion:—The temperature at which fusion commences is constant for any substance so long as the pressure remains constant;

and, from the time that fusion commences, the temperature remains stationary until the whole of the substance is melted. Some substances, as iron and wax, soften gradually before they actually fuse, while others, as lead and copper, melt without this softening. In the case of iron, great advantage is derived from this property, as by means of it the blacksmith can weld different pieces together, or mould them to shape on his anvil. This cannot be done with those metals which do not soften in this way.

LATENT HEAT OF WATER AND STEAM.

Heat has to be communicated to a body to change it from one state to another, and during this conversion the body suffers no alteration of temperature. The quantity of heat required to change ice to liquid water is termed the latent heat of water, and the quantity of heat required to change liquid water to steam or gaseous water is spoken of as the latent heat of steam. We may therefore define *latent heat* as the quantity of heat required to change a body from a given state to another state without changing its temperature.

These facts are experimentally ascertained somewhat as follows:—A pound of water at 80° C. is mixed with a pound of liquid water at 0° C.; the temperature of the mixture is found to be 40° C., the mean of the two, *i.e.*, the hot water has had to impart, and the cold water to receive, equal quantities of heat to bring them to a given temperature. But if a pound of ice at 0° C. be mixed with another pound of water at 80° C., the temperature remains at 0° and all the ice is melted. Therefore 80 units of heat contained in the hot water have been rendered latent in converting the solid to liquid water, and this is the latent heat of water.

Let us next take the case of steam. Water in the flask (Fig. 15) is boiled, and when steam is issuing from the delivery tube, it is dipped into the jar of water at A. The steam condenses to the liquid state; the temperature of the water is raised, and its weight is increased by the amount of steam condensed. These are the data:—Temperature of water in the jar before the experiment 20° C.; after the experiment 40° C. Therefore the increase is 20° C. Weight of water in the flask at the commencement, 3·6 pounds; after the experiment, 3·72 pounds. Therefore, the weight of steam condensed is 0·12 of a pound. The issuing steam at 100° C. has been condensed and further lowered to 40° C. in raising the original weight of water to 40° C., *i.e.* in imparting—

$$3{\cdot}6 \times 20 = 72 \text{ units of heat.}$$

Now, if we deduct from this the quantity of heat imparted by the 0·12 of a pound of newly liquefied water in changing from 100° C. to 40° C., the difference will be the quantity of heat imparted by the same weight of steam at 100° C. in condensing to water at 100° C.—

$$72 - (0{\cdot}12 \times 60) = 64{\cdot}8 \text{ units of heat.}$$

Consequently, 64·8 units of heat have been imparted to the water in the jar, A, by the condensation of 0·12 of a pound of steam; therefore one pound of steam would yield 540 units of heat, since:—

$$0{\cdot}12 : 1 :: 64{\cdot}8 : 540.$$

And, conversely, it would take 540 units of heat to convert one pound of water at 100° C. into steam at the same temperature; 540 is therefore the latent heat of steam.

It is this large amount of latent heat in steam that renders it so useful as a heating agent, for it must be remembered that heat cannot be destroyed or annihilated, but is rendered sensible again when the steam becomes condensed.

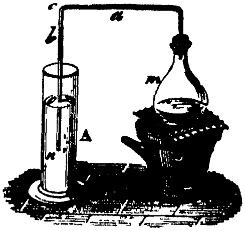

Fig. 15.

The great degree of heat to which the human body may be exposed without danger has often excited much attention. Meat and eggs have been cooked by being placed in a heated room in which men have remained all the time, and suffered no evil effects. The temperature of their bodies even has scarcely been at all increased by the high temperature around them. The reason of this is now, however, clear: the heat, instead of being employed in raising the temperature of the blood, is expended in preparing the perspiration and converting it into vapour, and in this way the whole of it is expended. The perspiration acts, in fact, as a natural safety-valve to regulate the temperature.

VARIATION OF FREEZING-POINT.
RAOULT'S LAW.

If all the air be driven out of water by boiling, and it is then allowed to cool without being disturbed, and is exposed to a low temperature, it will not freeze till several degrees below 0° C.; but as soon as any ice forms, the rest of the water will at once rise to that point, clearly showing that the latent heat of water is given out as it freezes. This fact clearly explains why a coat of ice forms so slowly. Were it not for this provision, as soon as any mass of water had sunk to the temperature of 0° C., it would become a mass of ice; but now, every particle as it freezes gives out its latent heat, and thus raises the temperature of the rest.

It has recently been shown that the freezing-point of a solution bears a relation to the molecular weight of the dissolved substance. (For the meaning of "molecular weight," *see* lessons on Chemistry.) The law, which is generally known as Raoult's law, may be thus expressed:—If the molecular weight in grammes of any substance be dissolved in 100 times the molecular weight in grammes of any liquid, the freezing-point of this liquid will be lowered by 0·63° C.

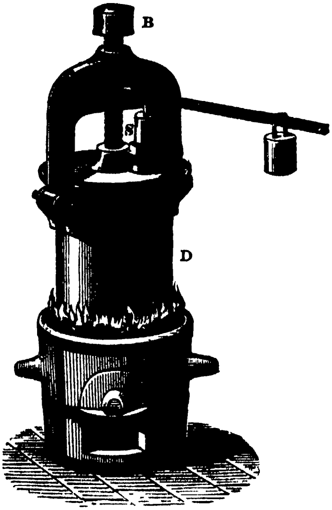

Fig. 16.

FREEZING MIXTURES.

Dissolving any substance in a liquid always lowers the temperature. This may easily be seen by throwing some salt into water, and carefully observing the effect produced on a thermometer placed in it. This absorption of heat during liquefaction is turned to account in the preparation of freezing mixtures for the production of artificial cold. In these, two or more substances which have a chemical affinity for each other, and of which one at least is a solid, are mixed together, and during the solution a considerable amount of heat is rendered latent.

Many different mixtures have been used, one or two of which we give here.

A mixture of about two parts of snow or pounded ice to one of salt will reduce the temperature to 0° on the Fahrenheit scale. This point, in fact, was chosen by Fahrenheit as the zero of his scale, as he believed it was the lowest temperature attainable. The mixture rapidly liquefies, and if a small vessel of water be placed in it, the water will speedily be frozen. A mixture of 6 parts of sulphate of soda, 5 of nitrate of ammonia, and 4 of dilute nitric acid, will cause a still greater reduction of temperature.

VARIATION OF BOILING-POINT WITH PRESSURE.

Water on attaining the temperature of 212° F. enters into a state of ebullition; a large number of bubbles of steam are produced at the part of the vessel which is exposed to the source of heat; these rise through the liquid, violently agitating it as they burst. The point at which this ebullition commences is that at which the tension of the steam becomes sufficient to overcome the pressure of the atmosphere; and hence, if this pressure be increased, the boiling-point will be raised.

Thus, though the boiling-point of water is said to be 212° F., this is only true when the barometer stands at 30 inches; when it is lower than this, water boils at a lower temperature.

In an open vessel the temperature of a liquid can never be raised above its boiling-point, as *all* the surplus heat received is employed in evaporating the water. If, however, a closed vessel be employed, the pressure may be increased, and a much higher temperature attained. The apparatus usually employed for this purpose is known as Papin's Digester, and is represented in Fig. 16. It consists of a strong iron vessel, D, the lid of which is fixed on tightly by means of a screw, B. A safety-valve, S, is also provided, so as to allow of the escape of the vapour when its elastic force becomes too great. In this way a temperature greatly exceeding 212° F. may be attained, and many substances are thus dissolved which are otherwise insoluble.

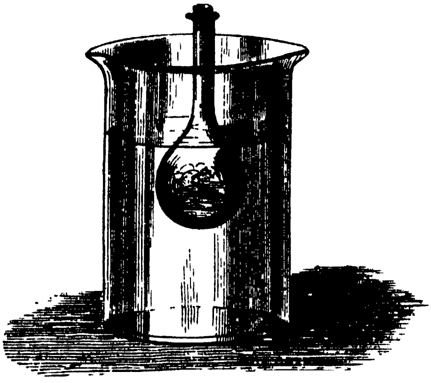

Fig. 17.

The fact that water boils at a lower temperature if the pressure on it be diminished may easily be proved experimentally. Pour some water into a flask, and place it over a spirit-lamp till it boils; when the steam is issuing freely, remove the lamp and cork the flask tightly. After a few minutes pour a stream of cold water on the outside or immerse it in the cold water, and ebullition will immediately recommence. The steam has expelled the air, the upper part of the flask being filled with watery vapour. The cold, however, condenses this, and thus a partial vacuum is produced, and the pressure is diminished, in consequence of which the water begins again to boil (Fig. 17).

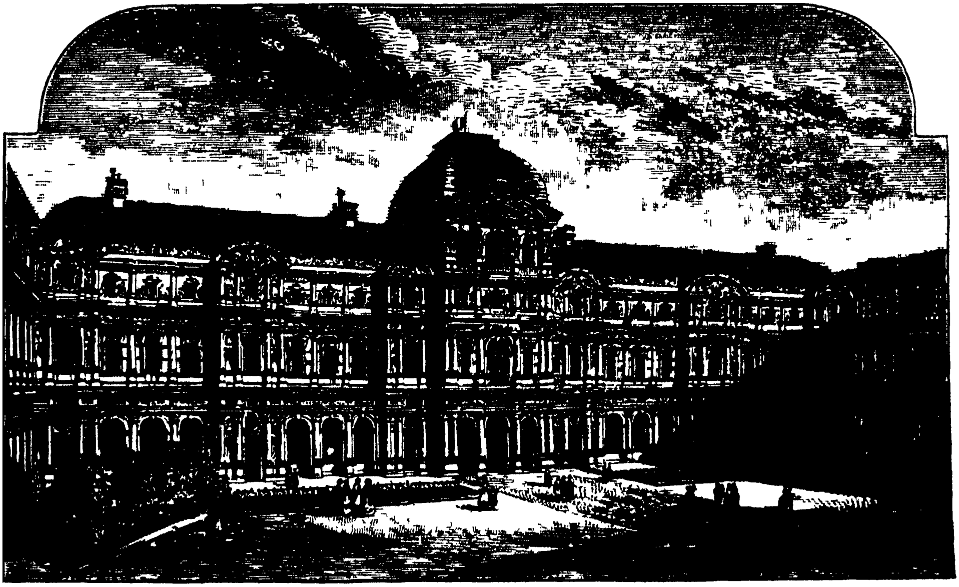

Fig. 45.—The Louvre, Paris.

ARCHITECTURE—XII.

[*Continued from p. 75.*]

THE ITALIAN, OR RENAISSANCE STYLE (*continued*).

We must now, however, turn to France, where the transition period is known as the style of Francis I. The introduction of the Cinque-Cento ornament in France took place whilst the latest phase of French Gothic, the Flamboyant (Fig. 46), was still in full development, and at first is only found in decorative work such as in the sculpture of tombs, of jubes or rood-screens, or of choir-stalls. It crept in gradually at the beginning of the sixteenth century, one of its earliest specimens being the choir of St. Peter's at Caen, though found, more or less, throughout France. The chief centre where it abounds is on the banks of the Loire, in the palaces built by Francis I., and in the numerous mansions of the nobility who settled down in the neighbourhood of the French Court. The style is the work of artists who still retain the traditional spirit of Gothic design, but introduce ornament and mouldings which partake of classic origin. The work is strictly confined to mansions, though here and there churches may be found in which the same principle of design obtains. The church of St. Eustache, at Paris, is a notable example of a building designed on Gothic principles with debased forms of classic orders and ornaments employed for the details. In secular work the finest examples are found in the châteaux of Chambord, Blois, Chenonceaux, and Azay-le-Rideau, and the town-halls of Beaugency and Orleans. The wall-decoration here, as in Italy, consists of the superposition of the orders, but the slight projection of the pilasters and the small importance given to the string courses, which in Italy were complete cornices, give an entirely different aspect. The blocks, too, are grouped in masses, relieved by square or by circular wings, a great change from the square blocks in which the Italian palaces are built. It is, however, chiefly in the lofty chimneys, and in the roofs, and the dormer windows which give light to them, that we find the principal attractions of the style. These were derived from the lofty roofs of Gothic work, and were quite unknown in Italy, where, if the roof be not absolutely flat, it has only a very slight rise, and is not visible except at a great distance. In the picturesque grouping of these roofs with the features resulting from them, the French architects evolved a style of extreme beauty, which now in England influences the new revival. In France, however, as in Italy, this transitional phase was destined to come to an end so soon as the laws and principles of the pure Italian orders were introduced into the country, and the first building in which their entry is seen is in the Louvre—in the first portico of the court of the old Louvre—built from the design of Pierre Lescot in 1540–48. It would seem that an Italian architect, Serlio, had been consulted; and it may possibly be to his influence that the classical purity of the superimposed orders with arcades between is to be ascribed. Lescot was assisted in his sculpture by Jean Goujon, who in the Fountain of the Innocents, and in other works in France, shows considerable delicacy and beauty in his sculpture. The introduction of Italian artists is also seen in the Palace of Fontainebleau, but chiefly in the interior in the sculpture of Primatichi. There is so much original French design in all these early works, that although Francis I. is said to have frequently called in the assistance of Italian architects, in the general principles of design they retained their own freedom. Whilst the Louvre was being built, Catharine de Medicis selected a spot some 400 to 500 feet to the west to erect her palace of the Tuileries, part of which was designed by Philibert-de-l'Orme, a distinguished French architect and writer. Later on the two were united by blocks, built in successive periods; and the east, north, and south parts of the outside of the court of the Louvre (Fig. 45) were built from the design of Perrault. The east part consists of a great peristyle of Corinthian columns coupled together, this being the chief novelty, and raised on a ground-floor base. The whole scheme was a sham, and has nothing to do with the internal arrangements of the building. The palace of the Luxembourg, by De Brosse, seems to have been influenced by the Pitti and Strozzi Palaces of Florence. The most important building of the seventeenth-century was the great palace at Versailles, mainly built by Louis XIV. at vast cost and with perhaps less architectural effect than any building of its kind. The palace was designed by Mansard, who was the architect of the Place des Victoires and the Place Vendôme at Paris. These are really a series of residences,

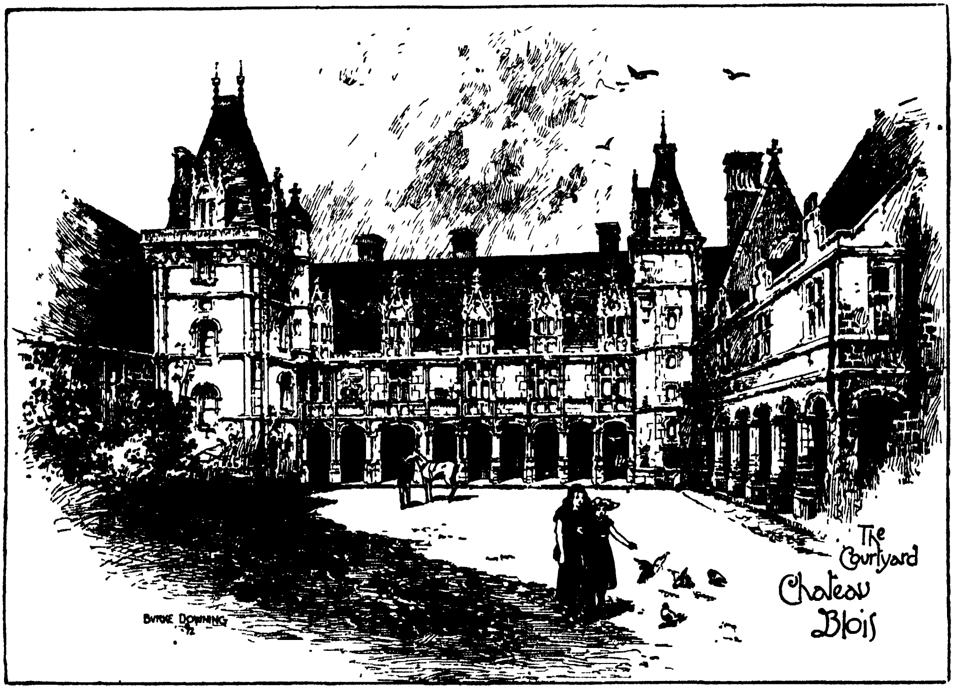

Fig. 46.—The Château of Blois (showing latest phase of French Gothic).

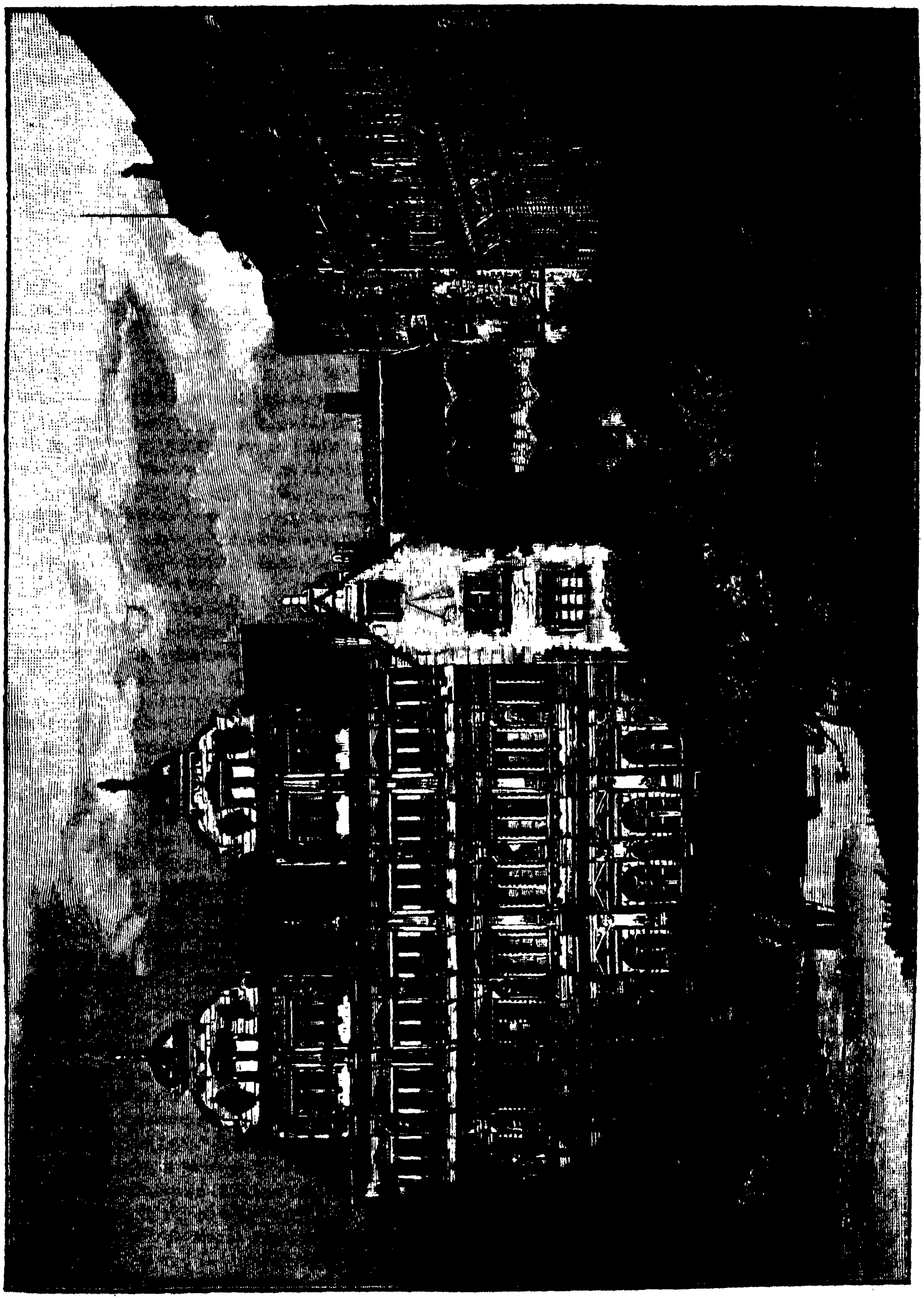

Fig. 47.—Heidelberg Castle.

but Mansard conceived the idea of making them all look like one palace, and set an example which, in this country, in Regent Street and in many of our squares, has been followed by the architects of the eighteenth century. The later phases of style are known by the names of the various monarchs who succeeded to the throne; and although in many cases there is a tendency to employ externally that rococo ornament which belongs to internal plasterwork, in the churches of the Invalides and St. Sulpice, in many of the public buildings in the Place de la Concorde, and in the St. Germain quarter, there are many fine palatial works. We no longer find, however, that picturesque design and that freedom from the conventional rules of Italian architecture which characterised the earlier examples. Many of these, now destroyed, have been illustrated in a well known work by Du Cerceau, an architect of the sixteenth century, to which we must refer our readers.

Almost with the single exception of the Castle of Heidelberg (Fig. 47), there is no transition work in Germany which is to be compared either in its design or in the excellence of its ornament and sculpture with French or Italian work. This palace, however, both in its commanding position and in the design and execution of its principal parts, is one of the richest and most effective compositions of the style, and is more or less entirely uninfluenced by the rules and principles of the Italian masters. Here again we find the lofty roofs, dormer windows, and gables which characterise French work. The church of St. Michael at Munich, based on the church of St. Andrea at Mantua, is almost the only ecclesiastical building which is worthy of note; and there are no seventeenth or eighteenth century palaces in which anything is found beyond a feeble imitation of Italian design.

The commercial prosperity of the Netherlands, to which we have already drawn attention in the lesson on Gothic architecture, had there called for the production of magnificent town-halls, guildhalls, and other structures of a palatial character, in the various towns. The transitional period in Belgium and Holland, therefore, produced much of the same spirit as that which we find in France. The general design is Gothic; the details are borrowed from classic sources, but chiefly for their ornamental features, and without the strict rules of application of the orders as laid down by the Italian masters; consequently, we find throughout the sixteenth, seventeenth, and eighteenth centuries buildings erected of picturesque outline, admirably suited to their requirements, and owing to the admixture of brick as an essential building material, varieties of design, which may be said almost to constitute a style of its own.

Spain follows, on very much the same lines as that of France, a transition which is known as the Plateresque, or silversmith's, style, in which Gothic design and Renaissance ornament are found, the best examples of which are found in the Ayuntamiento or town-hall of Seville, the university of Salamanca, and the hospital of Leon; an Italian period, of which the Escurial (1563–90) and the palace of Madrid (1737–57) are the best known examples; and with a decadent or Rococo period of the very worst possible kind.

POLITICAL ECONOMY.—VIII.

(*Continued from p.* 88.)

EXCHANGE (*continued*).

EXCHANGE BECOMES BARTER AGAIN. — As the result of all these substitutes, the curious result follows that when a good monetary system is established in a country the use of coin soon begins to decline. The better the system, the greater (other things being equal) the facilities of commerce. But as commerce increases safe and handy substitutes are required for coin. Bank-notes were probably the first; then come bills of exchange, cheques, and "cable transfers." Now all these imply *a developed system of banking*.

The banks of Europe have originated in various ways. The earliest banks—*e.g.*, those of Genoa in the sixteenth century—were what we should call finance companies. They assisted the Government to borrow money by finding private people who would lend it through their agency. This also was the chief business at first of the Bank of England. The Bank of Amsterdam, as we have already said, was founded to save merchants the trouble of working out the exact value of the miscellaneous lots of foreign coin they received in payment. The bank counted it for them and credited it to them reduced to a standard "bank money"—which did not in fact exist as coin. They often made payments by orders on the bank for so much "bank money"—like modern cheques. Some of the English private banking firms were at first goldsmiths. In Charles II.'s time, Professor Jevons tells us, the goldsmiths of London often kept armed men, and took special precautions to protect their stock of plate. A custom arose of depositing sums of money with them, and paying them for keeping it safe. Eventually, of course, it was found that the money could be invested at interest, and so the custom of making a charge for keeping it was abolished and bankers allowed their customers part of the interest earned, so as to attract more money.

Primarily, then, the English banks arose as places of safe keeping for money; while some of the foreign banks from their origin were to a great extent providers of substitutes for coin. And in most countries this provision by the issue of bank-notes has been, or still is, the most important part of the banking function; but it has generally become necessary for Government to regulate the issue of bank-notes, either by taking it entirely into its own hands, or by licensing certain banks to issue certain amounts on condition that they keep a certain reserve.

Bank-note issue is in fact a lucrative privilege, and has often only been granted to banks by the Government in return for services rendered. In 1891 the Bank of Spain was permitted to increase its note issue on condition of lending the Government a very large sum without interest. The Bank of England received some of its privileges during the eighteenth century in return for similar services. In some of the United States note issue was at one time permitted to any banks which could show a certain reserve of specie; but the so-called "wild cat bankers" of the Western States, who issued notes and then suddenly closed their doors and disappeared with their specie reserve, brought bank-notes generally into discredit, and at the time of the War of Secession (in 1863) the Federal Government limited the privilege, and instituted the so-called "National Banks," which were obliged to invest a large part of their capital in United States' bonds, and received certain privileges of note issue in return. It is evident that this was a method of extracting loans from the banks; because, the success of the Federal Government being uncertain, they found a difficulty in inducing the public to lend them all the money they required for the war. But the reasons usually given for regulating note issue are to protect the public against fraud—for most people, especially among the working classes, cannot tell which banks are unlikely to meet their engagements—and to prevent an over-issue of notes, leading to speculative purchases and a commercial crisis. Should a bank have large powers of note issue with few or no restrictions as to reserve, the temptation would be very great to lend large sums (represented by notes) to speculative traders on very easy terms. These traders would thus be tempted into hazardous speculation, the competition between them would cut down their profits, and the notes, if in excess of the amount required by the trade of the country, would constantly be returning to the bank to be exchanged for gold, which it would be very difficult to provide fast enough. Hence, the notes would depreciate in value, the banks and many traders would fail, and there would be widespread loss. The deposit function, therefore, is coming to be the most important part of the work of most banks, and, as wealth increases, it is likely to be more important still.

Now, having this money deposited with it, the bank proceeds to lend it to traders, and, to some extent, to invest it in Government bonds, or other securities. Some banks, especially Colonial banks, lend money largely on mortgage; and sometimes a bank invests in productive enterprises, manufacture for instance; but it is generally held that this is undesirable, because it is of the first necessity to a bank to be able to convert its investments into coin, or the equivalent of coin, at once if more of its depositors than usual should want to withdraw their deposits in a hurry; and manufacturing enterprises cannot usually be disposed of rapidly, and should trade be bad their value greatly declines for the time. Most of the loans of a bank, therefore, are for short periods, and they are generally made to traders rather than to support productive labour in the strict sense of the term. They, in fact, facilitate transport and distribution rather than production, and stimulate the latter mainly by enabling merchants to get the product to market—lending them money, in fact, that they may buy in order to resell. This was originally done by issuing bank-notes: now it is often done by opening "credits," *i.e.*, allowing a trader to draw cheques up to a certain sum, on which he pays interest out of the gain he makes in the trade; or else by discounting either "accommodation bills," or regular bills of exchange.

The holder of a bill of exchange may, if he pleases, keep it till it reaches maturity, when he will be entitled to receive payment of the sum mentioned in it; or if he does not live in the place where it is payable, he may sell it to someone who wishes to pay a debt there, and does not want the risk and expense of sending coin (as we shall see in connection with foreign trade); or if he wants coin for it, he can have it discounted at once. As we have explained before, a bank or a "bill discounter," or "discount broker" will do this, deducting from the sum on the face of the bill a certain amount for trouble and risk, and something also representing the interest that the sum he advances may be supposed to produce in the time during which the bill has to run. Thus, if the interest was 4 per cent. per annum, and the bill for £100 were due on March 31st and were discounted on December 31st, this part of the sum deducted would be £1.

But now, how is this sum determined? As a matter of fact it is not by looking at the current rate of interest on safe investments, but by the relation between the supply of wealth ready to be lent for short periods, and the demand for it. Sometimes trade is brisk, traders are anxious to borrow, and the demand for loans is considerable. Sometimes again, trade is dull, either because the political condition of Europe is uncertain, or because too much wealth is locked up in unremunerative enterprises, or from a variety of other reasons, so there is but little demand for loans. Clearly, in the first of these cases, the demand will tend to exceed the supply, and the holders of loanable wealth (*i.e.*, the banks) will be able to exact high rates of interest, and so cut off a portion of the demand. In the second case, the banks will have a large amount of wealth which they will prefer to lend at low rates rather than to have it lie idle. That is, the rate of discount will be regulated by the relation between the supply of loans for short periods and the demand for them.

Now it so happens that from the institution of the Clearing House (which will be explained presently), the largest amount of that part of the wealth of the country which is ready to be lent for short periods is under the control of the Bank of England. Now when most of the supply of a commodity is in the hands of one holder, he can pretty well regulate its market value. There is little reason for the holders of smaller amounts to sell at less than the rate at which he sells; while, if they try to sell at a larger, they will certainly have to wait to dispose of their property till his is all gone. The Bank of England, then, periodically "fixes the rate" by announcing on what terms it will lend wealth expressed in money on the security of bills of exchange, and other holders of wealth to be lent in the same way follow those terms—though since of late years discount houses have multiplied, the Bank of England does not control so large a part of this capital as formerly, and the "Bank rate" is not followed so closely as it was. Nobody is compelled to follow it, but it is usually the interest of most people concerned to do so.

Generally speaking, the fixing of the Bank rate precedes rather than follows the increase of demand for loanable wealth, or the increased supply of it. Long experience indicates to the directors what demand there will be, and (what is more important) what amount of gold is likely to be sent abroad within a short period. A certain reserve must be kept by the Bank to meet contingencies, independently of the Bank Charter Act. Foreign countries frequently require gold—either to pay for goods they send us, or as a reserve against fresh note issues, or for other purposes; this latter gold is often borrowed, and it is the expectation that this most convenient form of wealth will be demanded abroad that induces the Bank of England to check the demand for these forms of loan, which may possibly increase the demand for gold in other ways. The mistake of the Mercantile System, repeated by some of the advocates of Protection, has been to exaggerate the importance of the presence of plenty of gold in the country; it is seen that the supply may be inadequate for a short time to the demand, and that so a want of confidence may arise. It is not seen that directly gold gets scanty it rises in purchasing power; and so traders will, unless artificially restricted, send gold to purchase goods where it is scarcest, and so the supply will be readjusted to the demand.

Let us here summarise the characteristics of the English banking system

An ordinary English bank has a capital, owned by the partners in the firm, or by the shareholders; and from the large scale on which English banks usually do business, private bankers are more and more giving way to large joint-stock companies. This capital is part of the security to the depositors that their deposits shall be repaid. Generally besides the actual paid-up capital, the shareholders are liable to be called upon to pay a good deal more, should the depositors' property be lost. Sometimes they are liable to make the whole of it good if necessary (as in private banks); but such liability may be a very serious matter for a shareholder, who can seldom know much about the management of a banking business. For instance, when the City of Glasgow Bank failed in 1878, the shareholders, from whom the state of its business had been concealed, not only had to lose their capital, but were called upon to pay twenty-seven times the amount besides. Generally, therefore, it is arranged that the shareholders' liability shall be limited. Often the amount is equal to the actual paid-up capital. On the faith of this liability and the paid-up capital, depositors lend their money, the deposits usually amounting at least to six or seven times as much as the paid-up capital. These sums are invested in various ways, usually such that they could be easily realised when more depositors than usual wish to withdraw their deposits.

Now it might be supposed that as every manager knows by experience about how much coin will be paid out by his bank in a given time, a sufficient reserve of coin would be kept in the bank vaults to meet the daily payments. But in England at any rate this is not so—owing to the existence of the Clearing House. The object of this is as follows. Suppose that of two banks, A and B, the cheques A holds on B on a given day amount to £10,000, while those that B holds on A amount to £15,000. Clearly it would be waste of time and trouble for B to pay A £10,000 and receive back the same money and £5,000 more. The business could be settled more simply by A paying B £5,000. Now the Clearing House is an elaborate device for simplifying these payments and counter-payments by striking balances between the banks concerned, and only those balances are paid. But they are not paid in coin. Each bank which is a member of the Clearing House keeps an account at the Bank of England, and in the case supposed the £5,000 would simply be debited to A's account, and credited to B's on that Bank's books. Every bank not a member of the Clearing House keeps an account with some bank that is so, and gets its debts and demands on other banks settled up indirectly through the Clearing House. Thus the banks do not care to keep much coin on their own premises; they deposit it in the Bank of England, knowing they can get it when they wish. Except for the restrictions imposed by the Bank Charter Act, and provided the Bank undertakes to furnish this coin on demand, it is free to dispose of this money as it pleases, and "it depends on the wisdom of its Directors whether the country shall be solvent or insolvent." In most countries, however, the specie reserve of the country is more or less under the control of the Government. In France, for instance, the Governor of the Bank of France is a State official; in the United States it rests with the Secretary of the Treasury to determine what portion of the reserve of the National Banks he will permit to be exchanged for the specie in the United States treasury. In England, though there is no such Government control, there is no practical danger, because the Directors of the Bank of England are leading business men, conscious of their responsibilities, very sensitive to public opinion, and likely to feel any shock to business, such as the mismanagement of the Bank would cause, as severely as anyone in the country in their own private affairs. There is, therefore, the best possible security for wise and cautious management.

We may note, to conclude this subject, that an outcry is often raised as to the contrast between the enormous dividends paid by English banks to their shareholders and the small sums allowed to their depositors. A bank paying 15 or 20 per cent. dividend annually, will give 2 or 2½ per cent. interest on deposits for fixed periods, and nothing at all on "current accounts," *i.e.*, for sums which the depositor can draw out in small amounts by cheque. But nothing can be more absurd than this outcry. A bank may have a paid-up capital of £1,000,000, and its shareholders may be liable to pay another million if it fails. On this security people deposit money with it, to the extent, let us say, of £20,000,000. Suppose it gets on the average four per cent. on the £21,000,000; the expenses of management are very heavy, especially those connected with the keeping of current accounts; something must be put by for reserve, and after allowing for these and say 2½ per cent. interest on deposits, or £500,000, there may not be enough left of the £840,000, which represents four per cent. on the capital and deposits, to give more than a fraction more interest to each depositor, though there may be enough to pay a handsome return on a capital the amount of which is only one-twentieth of that of the deposits. Every additional £10,000 of profit means 1 per cent. dividend, but only $\frac{1}{20}$ per cent. interest on deposits.

An institution called "The Co-operative Credit Bank" was based on the misunderstanding that underlies this outcry, some years ago. The proprietor announced that he would "allow depositors to participate in the profits," and pay them 15 per cent. per annum. Now no bank could do this continuously except by a series of miracles. The result was the speedy ruin of the bank, and when it stopped, the balance left for repayment of deposits was only a few shillings. Working men should guard very carefully against such professions.

Indeed, if a bank offered much higher interest on deposits than other banks in the same line of business do, it would probably mean that depositors would be very unwise to put their money there. The bank would be doing more hazardous business than other banks, and the high interest would mean extra insurance against risk—a risk which the depositor would have no control over, and to which he would be foolish to let his money be exposed.

International Trade.—From what we have said of bills of exchange, it will be easily understood that a trade conducted with them tends to become *essentially barter of goods for goods.* To take a simple case: An English merchant, A, ships £1,000 worth of biscuits to France to a correspondent, X; while another Frenchman, Y, ships £1,000 worth of wine to another English merchant, B. Now, it would be ridiculous for X to send A £1,000 in sovereigns, and B to send Y £1,000 in sovereigns too. X pays A by "accepting" A's bill on him, and B pays Y by "accepting" Y's bill on him, and meeting them when required—the bill being an order to pay the equivalent of £1,000 now, at a certain future date (as was previously explained). Then if Y's bill is made payable to A, and X's to B, the two bills will, as it were, cancel each other, and we shall really have £1,000 worth of biscuits exchanged for that value of wine. *Exports*, that is, *pay for imports.* This balancing of accounts goes on daily, and without any clear consciousness of it on the part of those concerned. It might very well happen that A did not at the moment know anyone who wanted to make any remittance to France. In this case he would sell his bill to a bill-broker, who would find some other person who did, and resell the bill to him. Now suppose at any time the amount of goods sent from England to France is less in value than that sent from France to England. Then, specie must be sent from England to pay the balance. But there is risk in this, and insurance must be paid as well as freight. So there will be an increased demand in England for bills payable in France (primarily to avoid sending specie), and the sum to be paid for each will rise. It will not rise *beyond* the amount which will be saved by sending bills instead of specie, but it may rise *to* that amount. Meanwhile, there will be more bills on England offered in France than are wanted, and so they will go to a discount. When, however, the imports and exports between any two countries are just equal in value, "the exchange is at par"—that is to say, by paying down so much gold in one of the countries, one can buy the right to receive the same amount in another country—the right being expressed by a bill.

In fact, of course, private persons do not themselves ship gold when they cannot get bills. The banks create the bills for them, and if they cannot meet their liabilities in any other way, ship gold equivalent to the value of the bills. Moreover when bills on a country are likely to be at a premium, it will pay merchants to push the sale of their goods there, to get the advantage of the premium; and when they are at a discount, the surplus may easily be worked off through some adjacent country. Thus, if bills on London were at a discount in Brazil, but Argentina were importing English goods largely, the buyers in Argentina might very likely arrange to buy Brazilian bills on London, and pay part of their debts with them. Between gold-using and silver-using countries, we must note, there can be no par of exchange.

We need not therefore be alarmed at "a drain of gold in return for foreign raw materials." This was one of the terrors held out by supporters of the old "Mercantile System." But if imports pay for exports, such a drain of gold is trifling; and the only reason why it matters is, that if it is extensive enough, it disturbs the basis of the note and paper circulation and shakes business confidence. But as soon as gold gets scarce in a country, prices fall, and more gold comes in to buy goods—just as any other commodity comes if it is demanded.

It must be noted, however, that the imports of England are annually nearly one-fifth more than her exports in value. So it may look at first sight as if we are paying the balance out of our national capital. But the balance is accounted for chiefly thus: (1) The values of the imports in the official statistics are returned plus freight, those of the exports minus freight. (2) What is much more important, the excess of imports is due to the fact that foreign countries contain a vast amount of British capital. Germany and France, of late years, have invested much capital abroad; but by far the largest amount of the European capital invested elsewhere than in Europe is English. Foreign governments and railway companies, and the other holders of this capital, pay interest, and, of course, do not send it in coin any more than merchants do, but in bills. The knowledge that there will be a demand for bills on London sends up the premium on them in these countries, and stimulates merchants (as we said) to send goods, that they may have bills on which the premium will be higher when they fall due. And as England does much of the carrying trade of foreign nations, payment for this tends to be made in the same way, that is, by bills representing goods, and so by the goods themselves.

In Dickens's story of "Dombey and Son," little Paul hears Mr. Baps, an amateur economist with old-fashioned ideas, ask Mr. Toots, "What you are to do with your raw materials when they come to your ports in exchange for a drain of gold." Mr. Toots, who does not understand these matters, replies, "Cook them." But in fact he was much more nearly right than Mr. Baps. Work up raw materials, add value to them, export them with this increased value, and let the "drain of gold" take care of itself.

That international trade is essentially barter is the first principle to be grasped. The second is, that such trade rests mainly, though not entirely, on international division of labour. Each country tends to produce what it is best fitted for; but it produces other things besides, either because it would be too expensive to import them from the countries where they can be more cheaply produced, or because capital and labour do not move between countries with perfect freedom. Investors do not like to put their capital in countries they know little about and cannot watch carefully. Not much more than an eighth of English capital, probably, is yet invested abroad; still English capital goes abroad far more freely than that of any other nation. Labour, too, emigrates far less freely than capital; indeed, extensive emigration is a matter only of the last half-century, and of most of it we may safely say that the emigrants would not have gone abroad if they could have made a comfortable living at home. Were it not for this hesitation among capitalists and labourers, capital and labour would speedily migrate to the most fertile countries, and the rest of the world would be depopulated. This is hardly likely to occur.

Hence, countries often produce things that are produced elsewhere much more cheaply, and, what is more remarkable, import goods they could produce more cheaply themselves. Thus, during the most active period of gold-mining in Australia, timber for pit-props was actually imported from Norway, though there was plenty in Australia. Butter was imported from Ireland, though much better butter could have been made in Australia. The reason was that Australia produced gold, and that it was more profitable to put all her available labour and capital into gold-mining, and to buy wood and butter with the results. Some of the West India Islands, again, could grow more corn per acre than most of the corn-growing districts of the United States But they can grow fruit so much better than the United States can that it pays better to concentrate their labour and capital on fruit-growing and import corn Quite lately, Portugal has been exporting potatoes and tomatoes to South Africa, which is a much more suitable country for growing them. The reason is that people in South Africa have still more profitable employments for their labour and capital than market gardening; and there happens to be good and quick communication between the countries. It is very likely that one reason why foreign fruit and eggs compete so largely with English fruit and eggs is that the staple industries of England afford more profitable employment for capital than gardening or poultry-rearing.

It must be carefully noted that the advantage of international trade is primarily a consumer's advantage. People are rather apt to look only at the question whether producers profit by it. The cotton-operative thinks it hard that English cotton goods should be undersold by foreign ones; the agriculturist, that English grain should be undersold by American. Both forget that all the community are benefited by getting their goods cheaper, both directly and indirectly. Real wages are higher, there is more wealth to save as capital, and so more possibility of employment for labour; though, no doubt, certain special trades may suffer seriously from foreign competition. But there are many other causes—the invention of new machinery, for instance, and consequent over-production—from which a trade may suffer quite as much or more.

APPLIED MECHANICS.—XVI.

[Continued from p. 92]

BENDING OR FLEXURE—STRENGTH AND STIFFNESS OF BEAMS—PRACTICAL RULES, ILLUSTRATIONS, AND EXAMPLES (*continued*).

THE important rules given in the last lesson will be better understood after working some examples which shall be of as practical a nature as possible.

NUMERICAL EXAMPLES.

1. A beam of English oak 25 feet long, 10 inches broad, and 14 inches deep, is supported at the ends and loaded at the centre: find its safe load, using 6 as a factor of safety.

The rule is—

$$W = c \times k \times \frac{bd^2}{l};$$

in this case,

$$W = \frac{1 \times 6680 \times 10 \times 14^2}{25 \times 12}, \text{ or } 43642 \text{ lb.}$$

Hence the safe load is—

$$\frac{43642}{6} = 7273{\cdot}6 \text{ lb}$$

2. A pitch-pine beam 30 feet long, 15 inches deep, and 12 inches broad, is fixed at the ends and loaded uniformly: find the safe total load, using the same factor of safety as before.

Answer, 24450 lb.

3. A floor 20 feet square is supported by a red pine beam, which is fixed into the walls. Supposing the beam to support the whole weight, that the flooring, etc., weighs 20 lb. per square foot, and that the room is to accommodate 120 persons, weighing on an average 120 lb. each—find the proper section for the beam, its breadth being two-thirds of its depth. Factor of safety as before.

The total load on the beam is—

$$400 \times 20 + 120 \times 120 = 22400 \text{ lb.}$$

This is the *safe* load; hence, the breaking-load is—

$$22400 \times 6 = 134400 \text{ lb.}$$

Our strength-rule gives us the equation—

$$134400 = \frac{3 \times 5350}{20 \times 12} \times \tfrac{2}{3}d \times d^2,$$

Or,

$$\frac{134400 \times 20 \times 12}{5350 \times 2} = d^3,$$

whence $d = 14{\cdot}44$ inches, and $b = 9{\cdot}62$ inches, the section required.

4. In the last example, if the factor of safety for the dead load is 5, and that for the live load 10, find the proper section for the beam.

Answer, depth, 16·04 inches;
breadth, 10·69 inches.

5. A timber beam is supported at points 12 feet apart, and loaded with weights of 10, 12, and 8 cwt.

at points 2, 5, and 9 feet respectively from the left-hand support: find the bending-moment at a section midway between the supports. If this bending-moment were produced by a load at the centre of the beam, find the amount of that load and the proper size for the beam, it being of teak, and its breadth ⅝ of its depth. Factor of safety, 6.

Explanation.—The bending-moment at the centre of the beam is found by taking the algebraic sum of the moments, about the section at the centre, of the forces to *one side* of that section. In this case, there are only *two* forces to the right of the section, and hence it will be easier to work from that end of the beam.

The supporting forces having been found by the method explained at page 282, Vol. VI., the bending-moment required is—

$$12\tfrac{2}{3} \times 6 - 8 \times 3 \text{ cwt.-feet} = 76 - 24 \text{ cwt.-feet}$$
$$= 52 \times 112 \times 12, \text{ or } 69{,}888 \text{ pound-inches.}$$

The equivalent load at the centre is 1941·3 lb., and the safe section for the beam is of depth 6·63 inches and breadth 4·14 inches.

6. A wrought-iron beam is of the section shown in the fourth figure of Table I., the breadth b being 8 inches, depth d 12 inches, and thickness of metal everywhere 1 inch. If the beam is 25 feet long, and supported at the ends, find the greatest uniformly-distributed load it will bear with safety, safe f being 9000.

Answer, 22744 lb. ($I = 568{\cdot}6$).

7. An iron beam is of the shape of a hollow cylinder, the outside diameter being 10 inches, and thickness of metal 1½ inch. If the beam is fixed firmly into two walls 30 feet apart, find the greatest uniform load it will bear with safety, safe f being 9000.

Answer, 22381 lb.

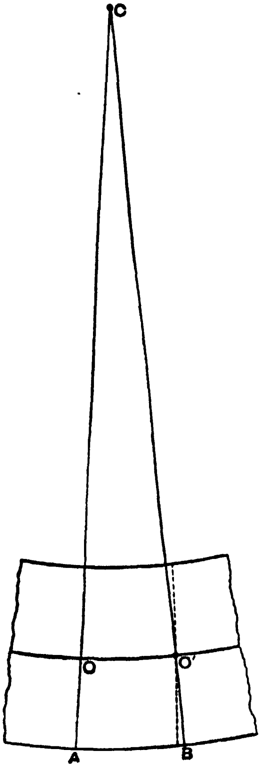

Fig. 95.

8. A beam of the same material is semicircular in section, the circle being 8 inches in diameter. It is supported, flat side downwards, at points 12 feet apart, and loaded uniformly: find the greatest safe load. Answer, 6120 lb.

STIFFNESS OF BEAMS—CHANGE OF CURVATURE—DEFLECTION—EASY RULES.

The strain in the case of a loaded beam is such that the beam if originally straight becomes curved, and if originally curved has its curvature increased or diminished according as the *added* loads act with or against those already present. The student probably understands roughly what is meant by "curvature." The mathematician, however, defines "curvature" as the *reciprocal of the radius of curvature*, this radius being the radius of the circle agreeing most nearly with the curve at the point indicated.

In Fig. 95 a small portion of a bent or curved beam is shown, the curvature being greatly exaggerated. Take O O′ (measured along the neutral line) = 1 inch, and O A = 1 inch; this will simplify our expressions. From the similarity of the sectors O O′ C and A B C it is evident that $\frac{\text{O O}'}{\text{O C}} = \frac{\text{A B}}{\text{A C}}$. Let O C be called r (the radius of curvature), then A C $= r + 1$. Also, A B = A N + N B = 1 + the strain at 1 inch from the neutral line.

It has already been shown that the *stress* at 1 inch from the neutral line is $\frac{\text{M}}{\text{I}}$; and since $\frac{\text{stress}}{\text{E}} = \text{strain}$, the strain at A B must be $\frac{\text{M}}{\text{E I}}$, and A B $= 1 + \frac{\text{M}}{\text{E I}}$.

Hence, $\frac{\text{O O}'}{\text{O C}} = \frac{\text{A B}}{\text{A C}}$ may be written—

$$\frac{1}{r} = \frac{1 + \frac{\text{M}}{\text{E I}}}{r+1};\ i.e.,\ \frac{r+1}{r} = 1 + \frac{\text{M}}{\text{E I}} \text{ or } \frac{1}{r} = \frac{\text{M}}{\text{E I}}.$$

In other words, a beam originally straight takes, when acted on by a bending-moment M, a curvature whose amount is obtained by dividing the bending-moment by the product of the modulus of elasticity of the material, and the moment of inertia of the section of the beam at the point specified.

If the beam was originally curved to a radius r_0, the addition of the bending-moment M produces a change of curvature:—

$$\frac{1}{r} - \frac{1}{r_0} = \frac{\text{M}}{\text{E I}}.$$

DEFLECTION OF BEAMS.

It is evident that the amount a beam "deflects," or dips below the straight line at any given point, depends on the curvature of the beam. The exact connection between curvature and deflection, and the method of finding the latter from the former, would take us somewhat beyond the scope of these lessons, and a slight acquaintance with the integral calculus would be necessary to understand or work out the results.

Taking, however, the case of a beam supported at the ends and loaded at the middle, the deflection, δ, there is found from the rule—

$$\delta = \frac{Wl^3}{48EI}.$$

The deflection of any of the beams referred to in Table II. is obtained by multiplying the right-hand side of this equation by the proper value of D, given in the fourth column of that table.

For beams of rectangular section, the simple rule—

$$\delta = D \times S \times \frac{Wl^3}{bd^3}$$

may be employed, values of S being given in Table III.

The student should work out the following examples carefully:—

EXAMPLES.

1. Find the deflection at the centre of a beam of English oak 30 feet long, 15 inches deep, and 10 inches broad, supported at the ends, and loaded at the centre with a load of 5000 lb.

Answer, 1·19 inches.

2. Find the greatest deflection of a pitch-pine beam 25 feet long, 14 inches deep, and 9 inches broad, fixed at the ends, and loaded at the centre with one-fifth of its breaking-load.

Answer, deflection, ·499 inch.
load, 15335 lb.

3. A solid cylindric wrought-iron shaft, 3 inches in diameter, is supported at points 16 feet apart, and loaded at the centre with a load of 400 lb. Find the deflection of the shaft, due to this load and to its own weight. A cubic inch of wrought-iron weighs ·28 lb., and E may be taken as = 28000000.

Note.—Find the deflection due to each load separately, and add the results to get the total deflection. Answer, ·844 inch.

4. A teak-beam, 20 inches square, is fixed firmly into walls 30 feet apart, and loaded uniformly. Find its greatest safe load, and the deflection under this load. Factor of safety, 5.

Answer, safe load, 122400 lb.
deflection, ·496 inch.

5. A wrought-iron beam of T-shaped section has the following dimensions:—Breadth of top flange, 5 inches; depth of web, 6 inches; thickness of metal everywhere, ¾ inch. The beam is 16 feet long, and fixed at the ends; find its deflection under its greatest safe uniformly-distributed load, and the amount of that load. Safe f, 9000; E, as in Example 3.

Answer, deflection, ·0816 inch.
safe load, 4586·6 lb. ($I = 36·97$).

THE DETERMINATION OF THE RESULTANT OF A NUMBER OF FORCES ACTING NOT THROUGH ONE POINT—FORCE AND LINK POLYGONS—INTRODUCTION TO GRAPHIC METHODS OF CALCULATION.

We have already pointed out that when a number of forces act at a point, they may be regarded as simple vector quantities, and their sum is readily obtained by the "polygon of forces." If, however, the forces do *not* act through one point, they may no longer be regarded as of the same simple order of vectors, and the determination of their sum or resultant involves a more complicated construction. We can best explain the matter by taking up one case. In Fig. 96 we have drawn four forces which act in one plane, but whose directions do not pass through one point. In Fig. 97 the force-polygon for these forces is drawn, and the magnitude and direction of the equilibrant (or resultant) is shown by the line A E. The difficulty, however, now faces us—*where* does this resultant act? Here, then, we have a new condition introduced, and hence our simple-polygon law is not adequate. We require the aid of what is known as the "link-polygon" as well as the force-polygon. We have already given (page 89) the analytical conditions for the equilibrium of a number of forces acting like those in Fig. 96. The same conditions, stated in the language of "graphics," are two, viz.—(1) The *force-polygon* must be closed, and (2) the *link-polygon* must be closed.

What do we mean by "link-polygon"? In answer, we proceed to explain how it is drawn. Choose any pole, or point, O, near the force-polygon, and join each corner of that polygon to the pole. This we have done in dotted lines, but the student can use different coloured inks instead. Before going further, notice how we have lettered our forces. Each *space* between two forces in Fig. 96 has a letter assigned to it, and we speak of the force A B, meaning that force which separates the space A from the space B. In the force-polygon this force is represented by the line A B, each letter here standing at a *corner* or apex of the polygon. Now, to draw the link-polygon, choose *any* point on the force A B (Fig. 96), and through the space A draw a line parallel to O A in Fig. 97, through space B a line parallel to O B, and meeting the last line on A B, through C a line parallel to O C, etc., until each space has its dotted line drawn in it. Now our link-polygon must be closed if the forces are to be in equilibrium; and if we want the resultant, we must suppose that with the help of that resultant—when found—with its arrow reversed, the forces are balanced. Now *close* the link-polygon by producing the lines in A and E till they meet at P, the resultant must act through the point P thus found. Hence we have only to impose a force whose magnitude and direction are represented by A E in the force-polygon, at the point P, and our work is complete. The student should follow this work carefully; for if what we have now done is thoroughly understood, no great difficulty will be experienced with other and more complicated exercises. The following statements should be carefully noted and put to the test by the student:—

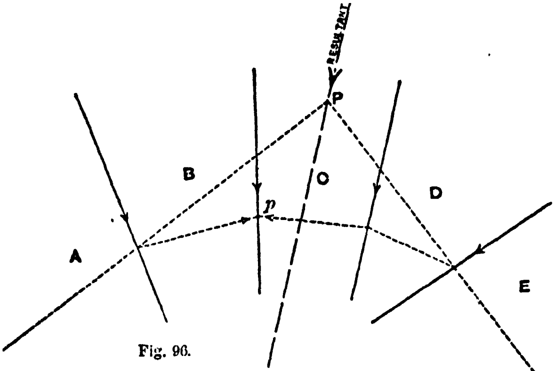

Fig. 96.

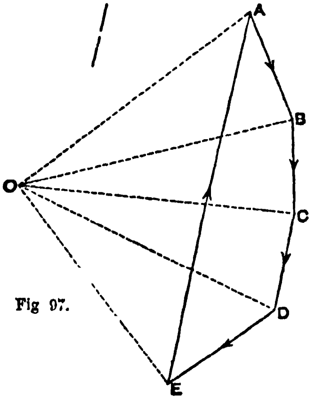

Fig 97.

(1) It does not matter *what* point on A is chosen to begin the link-polygon.

(2) It does not matter what point in the plane of the forces is chosen for the pole O, except that if chosen in certain positions the drawing is of awkward dimensions.

The result will be the same if different positions of these two points are tried; and a point (not necessarily the same point) on the resultant will be obtained in each case.

No amount of reading will ever enable the student to understand this beautiful subject, which we have only space to *introduce*. It is very much used now, especially in connection with the determination of the forces acting on the different pieces of structures such as railway girders and roof-trusses. In the few lines at our disposal we will endeavour to show you how to determine (1) the supporting forces and (2) the "stress," or more properly, the longitudinal *force* acting on each piece of such a structure, the loads and method of support being given. We must make the assumption that the pieces of the structure are fastened together with infinitely well-oiled pins, which ensures that the force acting on each piece can act only along *its length*. First of all, however, about the supporting forces. It is usual to assume that one end is hinged, and the other supported on rollers to allow for expansion due to heating; if these rollers move freely, the force at that end will act vertically, the rollers moving on a horizontal surface. The supporting force at the hinged end (H, Fig. 98) may act in an inclined direction which is not at present known; all we know is *one point* in its direction, viz., the *hinge*. Having found the resultant load on each "bay" of one side of the truss, by combining load due to weights of parts, possible snow, etc., with wind-pressure, by the parallelogram of forces, and for the other side taking simply the forces due to weights (since wind cannot act on both sides at once), our loads are now supposed found, and the "graphic" work proper begins. Draw the force-polygon A B C D E F G H (Fig. 99); this polygon is not yet complete, as we do not know the force acting at the hinge H. We *do* know the *direction* of the supporting force at the other end A; hence draw a vertical line of indefinite length from A in the force-polygon. Choose the pole O, and draw the radiating lines O A, O B, etc., as before: then draw the link-polygon, *commencing at the hinge*. The forces A B, B C, etc., have to be produced downwards, as shown dotted, and the corners of the link-polygon rest on these lines as explained in the last example. Having completed the link-polygon as far as the supporting force at A, the polygon is now made to close by a line through space I. In the force-polygon (Fig. 99) draw from O a line parallel to this closing side; this line cuts the vertical line A I in the point I, which is the last corner, or apex, of the force-polygon. The polygon can now be completed, and *the supporting force at* H *is represented by the line* IH to the *same scale* to which AB represents its particular force or load. The student should very carefully work out for himself such an example as this, and by so doing he will learn more than is possible by mere reading.

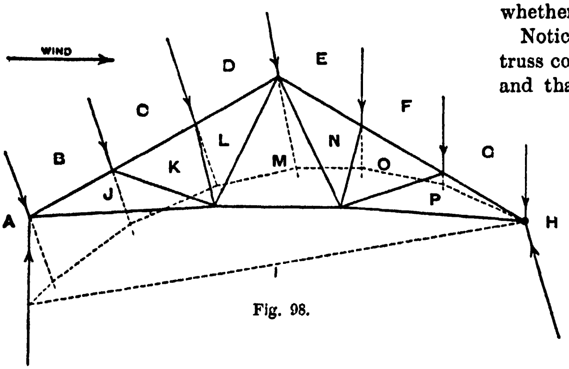

Fig. 98.

We have not space to go very fully into the method of finding the "stress" figure for this truss, but will endeavour to put the student on the right track, so that he may complete the work without much difficulty. The force in each piece is supposed to act *along* the piece, so that at a corner, say A, we have four forces acting—the load AB, the supporting force AI, and the force due to the push or pull of each of the pieces BJ and JI. If these forces are in equilibrium, they ought to be parallel and proportional to the sides of a polygon. Let us draw such a polygon. Well, in Fig. 99 we have already two of these sides, AB and AI; hence it is only necessary to complete the polygon, which is done by drawing a line from B parallel to BJ (Fig. 98) and a line from I parallel to IJ. These lines intersect in the point J, and give us the polygon of forces, or "stresses," ABJIA for the point A. The line BJ shows (to the same scale as that to which AB represents load) the force acting on the piece BJ of the truss, trying either to crush it or to pull it asunder. Which of these does the force try to do? Well, this is easily found from the polygon ABJI; for the directions of the arrowheads on AB and AI are fixed, and the other arrowheads must be concurrent with these. Hence we see that the piece BJ *pushes* the point A, and that the piece IJ *pulls* the same point; or in other words, the former is a *strut* and the latter a *tie*. Remembering that a piece which pushes with a given force at one end pushes *with an equal force at the other end*, we know the action of the piece BJ at the next point BCKJ, and we can proceed to draw the "stress" polygon for it, as in the case of the last point. Two *of the sides of the polygon we already have in Fig.* 99, viz., BC and BJ. The polygon when completed is found to be BJKCB; and by a similar process to that adopted before, the *character* of the force—whether tensile or compressive—can be determined.

Notice that each point where lines meet in the truss corresponds to a polygon in the stress figure, and that each line in the former is parallel to a corresponding line in the latter. Such figures are called *reciprocal figures.*

We have not *proved* to you that when the force and link polygons are closed, the system of forces is in equilibrium. With the force-polygon we have already dealt, and shown you that if it is closed the forces would be in equilibrium if they acted at a point. The proposition in regard to the link-polygon may be proved in the following way:—Along each line, such as B, of the link-polygon (Fig. 96) introduce equal and opposite forces. This will not alter the equilibrium or want of equilibrium of the original forces. Now consider any corner, say *p*, of the link-polygon. The three forces acting there are parallel to the sides of the triangle BCO (Fig. 97), and hence are in equilibrium. In the same way it will be seen that the forces at each corner are parallel to the sides of a triangle in Fig. 97, and therefore in equilibrium. Hence, the whole system, consisting of the original and the superimposed

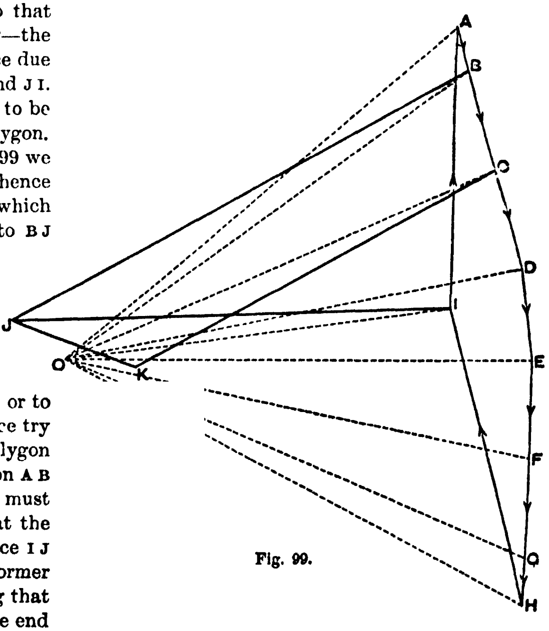

Fig. 99.

forces, is in equilibrium, the forces balancing in triplets. The superimposed forces are in equilibrium, balancing in pairs; hence, the original forces must be in equilibrium.

It is a rather important proof, and the student would do well to try to master it.

LOGIC.—II.

[*Continued from p.* 98.]

DIVISION AND DEFINITION.

The consideration of Species and Genera naturally leads to that of Division and Definition, as they are regarded by logicians.

The name Individual is sometimes given to a Singular term, because it cannot be *divided* logically; or, in other words, is incapable of being analysed into several subordinate species, or into individuals. We are metaphorically said to divide a term when we enumerate the several kinds signified by it, since we then distinguish many things in one. Thus, if we say that "animal" is both "man" and "brute" (*i.e.*, that the term animal has those two significations), we are said to *divide* "animal" *into* "man" and "brute." *Division*, then, which is thus applicable only to a common or universal term, may be defined as "the distinct enumeration of the several things which are signified by a common or universal term."

The process which is the opposite to Division is called *Generalisation*. This process is carried on by means of Abstraction, which is, speaking generally, the separate consideration of certain attributes of an object, the rest being left out of view. Let us take, as an illustration, our idea of any individual man. The idea includes, amongst others, the several ideas of substance, body, life, sensation, and reason, together with the ideas of a particular height, figure, countenance, colour, birth, etc.—all which latter ideas are *peculiar* to the individual man, while the former are *common* to him and all other men. Now if we take into consideration the former attributes only, and disregard the latter, we have, instead of the idea of a particular man, that of "man" in general. In other words, we have by the exercise of abstraction *generalised*, *i.e.*, arrived at an idea more general or universal than that with which we started. The idea of "man" thus obtained may be generalised still further. If we leave out of the ideas contained in it that of reason, which is peculiar to man, we shall have the idea of substance, body, life, and sensation remaining, which are common to man with other living beings. We thus arrive at the still more general idea of "animal"; and in this instance we might carry the process of generalisation even still further. Enough, however, has been said to make clear what is meant by calling Division and Generalisation the opposites to one another; for, as in the former we *add on* the differences by which several things are distinguished so as to enumerate *each* of them by a different and distinct name, so in the latter we *lay aside* the differences to call *all* the things by one common name.

Logicians are accustomed to enumerate several rules of Division, the principal of which are these three:—(1) Each of the parts, or any number of them short of all, must contain less than the thing to be divided, *i.e.*, must have a narrower signification. (2) All the parts, taken together, must contain neither more nor less than the thing to be divided; they must be exactly equal to it in extent. (3) The parts or members of the Division must be opposed, *i.e.*, any portion of one of them must not be contained in any other. Books must not be divided, for instance, into "English," "Quarto," and "Poetical"; for if this were done, some of the individuals of each class would be contained in both of the other two. To guard against violating this law, the same *principle* of division adopted at its commencement must be kept in view throughout the process.

The use of the word *Definition* in Logic is also metaphorical; for, originally meaning "marking out by boundaries," it is here employed to signify the expressions and words by which those things which we wish to distinguish from one another are discriminated from those which border on them, like fields by their boundaries.

Logicians have commonly distinguished two kinds of definition, *Nominal* (nomen, *a name*), which explains the meaning of the term defined, and *Real*, which explains the nature of the thing which the term signifies. A Real definition, again, may be either *Accidental* or *Essential*, *i.e.*, it may either assign to the thing to be defined what may be called its accidental attributes (*e.g.*, its causes, effects, properties, or other things of that kind), or give what are regarded as the constituent parts of its essence, these being the attributes which the object *must* possess in order to belong to the particular species. An Essential Definition may also be divided into *Logical*, which consists of the Genus and Difference; and *Physical*, which enumerates the parts of the thing which are *actually* separable. "Man," for instance—to illustrate these several methods of Real Definition—may be defined Accidentally as "a featherless biped"; Logically, as "a rational animal" ("animal" being the Genus, "rational" the Difference); and, Physically, as "a natural existence consisting of an organised body and a rational soul." But some of these distinctions are of doubtful value.

The three principal rules of definition are:—(1) The definition must be *adequate*, *i.e.*, it must not be either narrower or wider than the thing to be defined: if it were too narrow it would include less, and if too wide more, than the whole signification of the thing. If we defined "man" as "a living substance," we should commit the former mistake; if as "a rational animal of a white colour," the latter. (2) The Definition must be in itself *clearer* than the thing to be defined, otherwise it would not explain it. (3) It must be couched in a convenient number of appropriate words, *i.e.*, words in common use.

OPPOSITION AND CONVERSION.

Two Propositions are said to be *opposed* to one another when, having the same Subject and the same Predicate, they differ in quantity or quality, or both. Hence there must be four different kinds of *Opposition*. If we take the same subject and the same Predicate, we can obviously make out of them four different Propositions, which are represented by the four symbols A, E, I, and O. Thus, let X represent the subject, and Y the Predicate, we shall have the several propositions, "All X is Y," "No X is Y," "Some X is Y," and "Some X is not Y," any two of which are said to be mutually opposed. Hence there result the following four kinds of Opposition:—

(1) *Contradictory.*—Where the two propositions differ both in quantity and quality, they are called Contradictories. These will, of course, be A and O, or E and I.

(2) *Contrary.*—This takes place between propositions which differ in quality only, and which are both universal, *i.e.*, between A and E.

(3) *Subcontrary.*—Where propositions differ in quality only, but are both particular, they are called Subcontraries. This kind of Opposition, therefore, exists only between I and O.

(4) *Subalternate.*—This kind of Opposition is between those propositions which differ in quantity only. It may, consequently, be either between A and I, or between E and O.

Certain Rules or Canons of Opposition have been laid down by logicians, in reference to what may be inferred from the truth or falsehood of one of two opposed propositions as to the truth or falsehood of the other. These are most conveniently enumerated as four, one in reference to each species of opposition.

(1) Contradictories cannot be both true or both false at the same time; one of them must be true, and the other false. If the negative be true, the affirmative must be false; and if the negative be false, the affirmative must be true; and *vice versâ.* This will appear manifest if we recollect that everything (whether individual or species), without exception, must either belong to any given class or not, must possess a given attribute or be destitute of it. Every A, as this is sometimes expressed, must be either B or not B.

(2) Of Contraries, both at the same time may be false, but cannot be true. It is not necessary that either *all* or *none* of the members of a species must possess a certain attribute; for example, the two propositions, "All men have the right to freedom," and "No men have the right to freedom," are *both* false. Contraries cannot, however, at the same time both be true. If it be true that a given predicate may be *asserted* of the whole of a class, the same predicate cannot with truth be *denied* of the whole. If, for instance, we lay down as true that "*all* men have a right to freedom," we cannot with consistency maintain also that "*no* men have such a right." Hence, although if we are told that one of two Contraries is false, this does not enable us to determine whether the other is false or not, yet, if we know that one is true, we are certain that the other must be false.

(3) Subcontraries may be at the same time both true, or one of them false and the other true, but not both false. Where an attribute belongs to part of a class, and does not belong to the rest, *e.g.*, "some men are wise," "some men are not wise," there the Subcontraries are both true. If, on the other hand, such a proposition as "some men are stones" is false, it cannot be so unless "some men are not stones" is true. If, therefore, we are given the falsehood of one Subcontrary, we may infer the truth of the other; but by our being given the truth of one, we are not given anything as to the truth or falsehood of the other, as they may, as we have seen, be both true.

(4) Lastly, in Subalternation the two propositions may be at the same time one true and one false, or both false, or both true. There are thus four cases which may arise, and in two of these we have grounds for inference, while in the remaining two we are without them. If the Universal (generally called the *Subalternans*) is true, the Particular (generally called the *Subalterna*) is true also. If "all men are mortal" and "no men are stones" are true, so also must be the corresponding Particulars, "some men are mortals" and "some men are not stones." We cannot, however, reverse the process, and infer the truth of the Universal from our knowledge of the truth of the Particular. It does not follow from "some men are mad," for example, that "all men

are mad." *Secondly*, where we have ascertained that the Particular is false, we know that the Universal also is false. That "some men are stones" could not be false, unless it was also false that "all men are stones." *Thirdly*, if, however, what we are given is the falsehood of the Universal, we cannot, merely from knowing this much, say whether the Particular is true or not. To learn that we *cannot* truly say that *all* the individuals of a class do or do not, as the case may be, possess a certain attribute, is not to learn that we *can* truly say that *some* of them do or do not possess it. In certain cases, but not in all, the Particular is true, even when the Universal is false. Nor, *lastly*, are we warranted in asserting the truth of the Universal because we may be certain of the truth of the Particular. If the Subject and Predicate are "man" and "mortal," both the Subalterna and Subalternans will be true; but the former may be true—for example, in the proposition "some women are foolish"—where the latter is evidently false.

It should be remarked, before passing from this branch of the subject, that some logicians have refused to regard Subcontrariety as a species of opposition at all. And, speaking strictly, it would seem as if they were right, as according to the definition of Opposition above given, the subject in the two Subcontraries is not always exactly the same. In the propositions "some men are wise" and "some men are not wise," it is not really the *same* individual men which we are speaking of in each. We mean in the one "some men," and in the other "some *other* men," different from those spoken of in the former proposition. No confusion, however, need arise from following the ordinary classification, if this observation is kept in mind.

We must next consider *Conversion*. This, unlike Opposition, which is a mere species of relation borne to one another by propositions of a certain kind, is a process actually performed, by which one proposition is *changed* into another, which then bears a certain relation to the former. This will naturally, being a process of inference, lead us on to the theory and use of the Syllogism; indeed, some writers have considered Conversion as at bottom a process of reasoning, capable of being reduced to a syllogistic form.

A proposition, then, is said to be converted when its extremes (or terms) are *transposed*, *i.e.*, when the subject is put into the place of the predicate, and the predicate into the place of the subject, so as to form a new proposition. The name of *Convertend* is given to the proposition to be converted, and that of *Converse* to the new one which results from the transposition. Logicians differ widely as to whether the judgment expressed by the converse is a new judgment, or merely the old one expressed in another form; while some would treat Opposition, as well as Conversion, as a form of elementary reasoning or "Immediate Inference." But these are questions of too great detail and difficulty to consider for the purpose we have in view.

Conversion may be effected in various ways, but those principally employed in Logical treatises are two—*Simple* and *Per Accidens*.

Simple conversion is that in which both the quantity and the quality of the converse are the same as those of the convertend, in which case, of course, the operation does not change the symbol by which the proposition is to be designated. It will be found that the only propositions which can be thus dealt with are E and I. "No virtuous man is a rebel" may be converted into "no rebel is a virtuous man," and "some boasters are cowards" into "some cowards are boasters"; and in each of these cases the conversion is said to be *illative*, *i.e.*, the truth of the converse follows from, may be *inferred from*, the truth of the convertend. The one cannot be true unless the other is.

We cannot, however, deal with A in the same manner. In it, as we have already seen, the predicate is undistributed. Consequently, if we simply transposed the terms, and let the quantity of the proposition still remain universal, we should have the term, which as predicate of the convertend, was undistributed, distributed when used as subject of the converse. Of course this is an operation which may actually be performed; but the process will not be illative. We are not able to *infer* the truth of the new proposition from the truth of the old; and this plainly, because the fact that a *part* only of all the individuals or objects signified by the term used as predicate in the latter proposition was spoken about, cannot warrant us in making an assertion in the former about the *whole* of those individuals or objects. It may, indeed, happen accidentally that the new proposition is true with a universal subject; but this never results as a consequence from the truth of the old proposition, but depends on quite other grounds. "All equilateral triangles are equiangular" is true, and so is "all equiangular triangles are equilateral"; but the truth of the latter proposition cannot *be inferred* from the truth of the former. Hence it is that Euclid has given a separate and independent proof of each. It follows, therefore, that in converting A we must, in addition to transposing the terms, change the quantity from universal to particular, leaving the quality unchanged. This species of conversion has been termed by logicians Conversion *per Accidens.* The name has been chosen because this is not really a conversion of the universal *per se*, but by reason of *the accident* of its containing the particular. In other words, the particular to which A is thus said to be converted is not, strictly speaking, the converse of the universal A at all, but of the particular I which it contains, *i.e.*, whose truth is implied in its own.

Neither of these methods, however, will enable us to convert O. Whichever of them be adopted, the subject of the convertend, which in it is undistributed, would in the converse, being there the predicate of a negative, be distributed; and this would, for similar reasons to those above given against the *simple* conversion of A, be useless for the purposes of inference. O, however, may be converted simply by regarding it as I. This is done by considering the negative as *attached to the predicate* instead of by the copula. Thus, in "some who possess wealth are not happy," if we consider the predicate as "not-happy" instead of "happy," the proposition may practically be regarded as I, and then converted simply. This is called conversion by *Contraposition.*

It should be noticed that Singular Propositions are, for the purposes of conversion, regarded as Universals, inasmuch as their subjects may be said to be distributed, being used to stand for the *whole* of what they can be used to signify.

The result then is this: E and I are converted simply, A *per accidens*, and O by contraposition.

SYLLOGISM.

The complete understanding of the nature and theory of Syllogism, and its practical application, may be said to be the chief aim and end of Logic.

We have already seen that the third operation of the mind is Reasoning, and that this, when expressed in words, is called an Argument, or when put into a certain form laid down by logicians, a Syllogism. We may accept Archbishop Whately's definition of an *Argument*, which is "an expression in which from something laid down and granted as true (*i.e.*, the Premises), something else (*i.e.*, the Conclusion) beyond this must be admitted to be true, as following necessarily [resulting] from the other." The same writer defines a *Syllogism*, which is an argument stated in a regular logical form, as "an argument so expressed that the conclusiveness of it is manifest from the mere force of the expression," *i.e.*, without considering the meaning of the terms: *e.g.*, in this syllogism, "Every Y is X, Z is Y, therefore Z is X," the conclusion follows from the premises, whatever terms X, Y, and Z respectively are understood to stand for.

Reserving, however, for the time our explanation of the analysis and rules of the Syllogism, we will now briefly mention, to show their groundlessness, a few of the common erroneous impressions abroad upon the subject.

Some persons have considered it a conclusive argument against the utility of Logic in improving the reasoning powers and enabling us to reason better, to say that numbers reasoned very well before ever Logic was heard of, and that still greater numbers are in the habit of reasoning correctly now who are ignorant of even its fundamental principles. This is an objection to the study of Logic which, when reflected upon, must appear absurd. It might just as reasonably be said that a science of music was useless, because many persons are proficient in music who have never been scientifically taught, and who are wholly unacquainted with its principles; or that grammar may safely be neglected on the ground that all persons can speak, and many even grammatically, without ever having been taught it. Indeed, as Archbishop Whately remarks, the practice in any process respecting which any system has been formed, not only may exist independently of the theory, but must have preceded the theory.

There are others who consider that the method of reasoning by means of the syllogism is a peculiar method, and that there are other methods differing from it which may often be more conveniently employed in reference to particular subjects. This is a mistake. Syllogistic reasoning is not a peculiar form of reasoning, but is (with the possible exception of Induction, which we shall afterwards consider) the *one* form to which all correct reasoning may be reduced, or in which it may be exhibited. The reasoning process is in every case, no matter what may be the subject-matter on which it is employed, substantially *the same.* Quite as reasonably might one say that grammar was a peculiar language, and that men might speak correctly without speaking grammatically. Logic, in fact, in reference to the syllogistic process, is not *an* art or science of reasoning, but *the* art or science of doing so.

Other persons have strangely supposed that, when the logician teaches that all correct reasoning *must* be capable of being *reduced* to the syllogistic form, he means to convey that no one can use correct arguments, unless he *states* them severally at full length in this particular form. As well, to borrow Archbishop Whately's illustration, might it be supposed that when a chemist teaches us to analyse and resolve a compound substance into its simple elements, he means that we should never use it for any purpose without repeating the actual process of analysis, or that "to speak grammatically" means to *parse* every sentence that we utter.

METEOROLOGY.—II.

[Continued from p. 94.]

THE TEMPERATURE OF THE AIR, ITS MEASUREMENT AND DISTRIBUTION.

In many respects the primary and most important of meteorological observations is that of the temperature of the air. In supplementing the account of atmospheric temperature given in Vol. I., pp. 144–145, it will be convenient to consider, first, the instruments by which temperature is measured; secondly, its sources and their separate estimation; thirdly, the range of temperature, or its distribution in time, diurnal and annual; and lastly, its geographical or space-distribution.

A rough kind of thermoscope* in common use is that known for more than a century as the *camphor-glass* or *storm-glass*. This consists of a tube containing some air with a mixture of camphor, potassium nitrate, and ammonium chloride partly dissolved in alcohol and water. If the undissolved substance remains at the bottom, fine weather is said to be probable; if it rises gradually in feathery crystals, rain is likely; and if it rises higher while the liquid portion becomes turbid, storm may be anticipated. It does not seem a trustworthy guide.

Temperature is measured, and not merely indicated, by the various forms of the instrument known as the *thermometer*. It seems to have been invented in the sixteenth century, though by whom it is unknown. Galileo about 1612 seems to have introduced the use of alcohol in a closed tube: Robert Hooke in 1665 suggested the use of the freezing-point of water as the starting-point of the scale; and Halley in 1693 proposed its boiling-point as the upper fixed point, and the substitution of mercury for alcohol.

The advantages of mercury are its high conductivity as a metal and its low specific heat, which render it very sensitive, its regularity of expansion, and its high boiling-point. As it freezes at —40° (F. or C.), its indications in polar climates are not trustworthy, so that alcohol is still employed in *minimum* thermometers, those, that is, intended to register the greatest degrees of cold.

In 1714 Fahrenheit adopted as *zero* (0° F.) the temperature of a mixture of ice and salt, which he believed to be the greatest possible cold, and took blood-heat arbitrarily as 24°. This made the freezing-point 8°, and these large degrees being afterwards divided into four, the freezing-point became 32° F., blood-heat 96° F., and, the scale being continued, the boiling-point 212° F. This scale is still in general use in England, and its low zero (owing to which negative quantities rarely occur in temperate climates) and its short degrees, giving more accurate results, render it the favourite scale of meteorologists. In 1730 Réaumur introduced the scale still popular in Germany, with freezing-point zero (0° R.), and boiling-point 80°: in 1742 Celsius took 0° as the boiling-point and 100° as the freezing-point; and this scale, inverted by Linnæus, and known as the Centigrade, is now in general use abroad and in chemistry and physics. The degrees of the three scales being in the ratio of 9° F.=5° C.=4° R., to convert readings in C. to R., multiply by 4, and divide by 5; *vice versâ*, to convert R. to C., multiply by 5 and divide by 4; to convert C. or R. to F., multiply by 9, divide by 5 or 4, as the case may be, and then add 32; or to convert F. into C. or R., begin by subtracting 32, multiply by 5 or 4, and then, in either case, divide by 9.

Thermometers have their freezing-point fixed by immersion in melting snow, and their boiling-point by exposure to the vapour of water boiling under a standard barometric pressure of 29·905 in. in the latitude of London. They can be tested at Kew Observatory, and no space of ten degrees on the scale should be more than 0·3° wrong. "Displacement of zero" is a defect in the readings due to long-continued irregular shrinkage of the glass of the bulb, and necessitates a simple testing at intervals and deduction from the records.

In addition to ordinary thermometers, self-registering instruments are used to record maximum and minimum temperatures. Negretti's maximum thermometer (Fig. 1), though difficult to make, is not very liable to get out of order, and if hung exactly horizontal is very accurate. The tube is so constricted close to the bulb that the mercury can pass in expanding, but is not drawn back when the temperature falls. The instrument is set by swinging it briskly, bulb downwards, until the mercury passes the constriction.

John Rutherford's minimum thermometer (Fig. 2), invented in 1790, is the pattern in common use. It is a horizontal spirit thermometer with the bulb below the tube, and a light porcelain index in the liquid. When the temperature rises the spirit flows past the index, but in falling capillary attraction draws the index down with it. This instrument is liable to become very defective from evaporation of part of the spirit.

It is now the rule in England to take the reading of both maximum and minimum thermometers at 9 p.m. daily, and to take the mean of the two readings as the average or mean temperature for the day, beginning at the previous midnight. Thus

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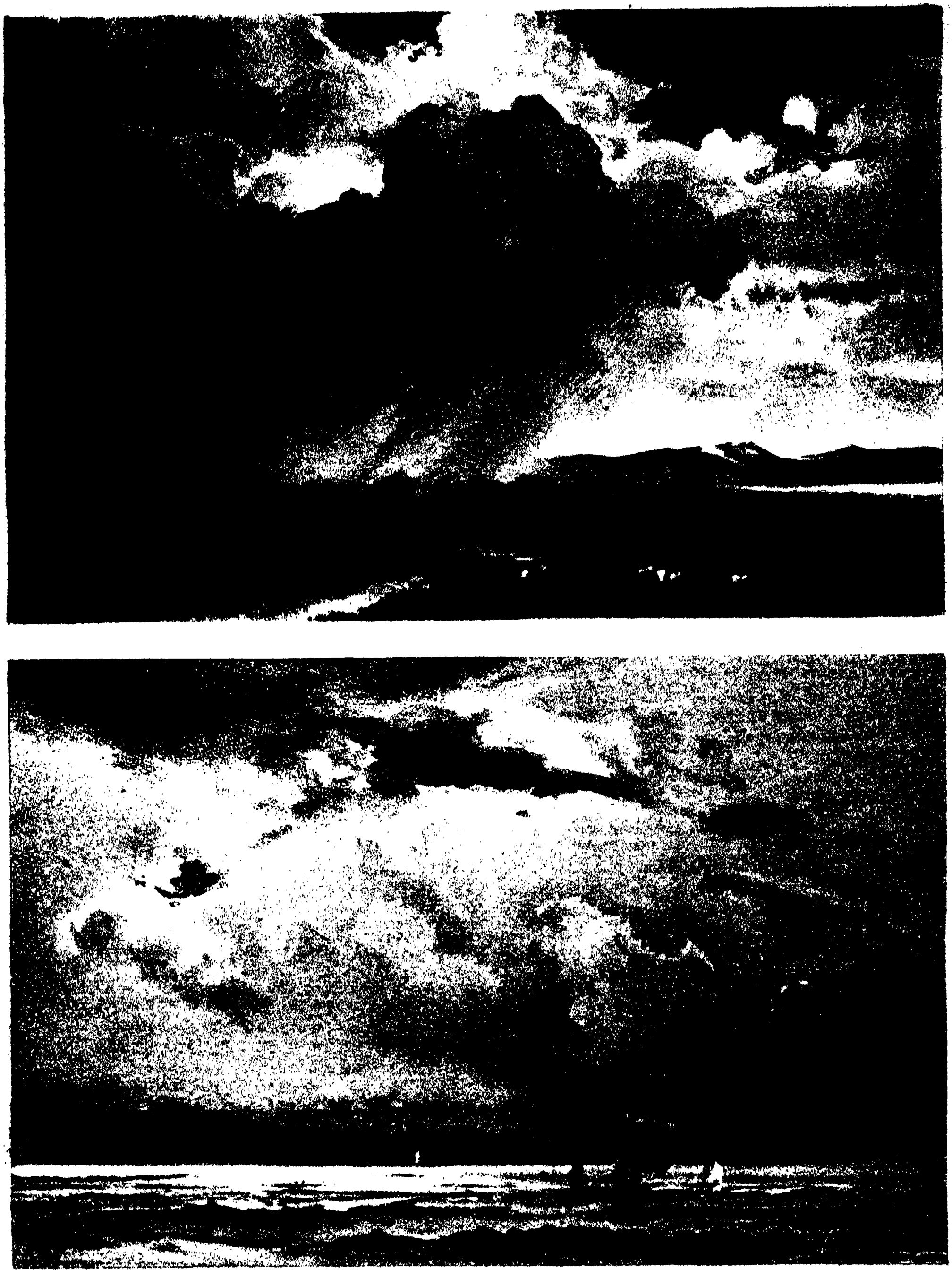
* Instruments having names terminated in "-meter" (*μέτρον, mĕtrŏn*, measure) are more exact in their indications than those terminated in "-scope" (*σκοπέω, skŏpĕō*, I observe).



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STORM CLOUDS.

1. STORM APPROACHING. 2. STORM DEPARTING.

it is agreed to employ the civil, not the astronomical, day. Similarly, though "the only logical subdivision of the year is into 73 periods of five days each," for ordinary purposes monthly means, *i.e.*, averages of the 28, 29, 30, or 31 daily means in a month, are employed.

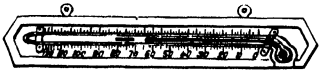

Fig. 1.—Maximum Thermometer.

To obtain a continuous record of temperature, the *photographic thermograph* is used, a photograph being taken on sensitised paper, stretched on a drum revolving by clockwork, either of an air-bubble introduced into the column of mercury, or of the space above the column. The tracing so obtained is termed a *thermogram.*

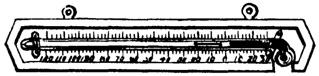

Fig. 2.—Minimum Thermometer.

A very difficult problem is how to place our thermometers to obtain the true temperature of the open air. For isolated observations a *sling thermometer*, tied to a string and swung round the head, gives accurate results; but for continuous observations some form of screen to exclude the effects of radiation is desirable. That most used, though rather small and confined, is Mr. Thomas Stevenson's, a wooden box 23 in. long, 14 in. broad, and 18 in. high, double-louvred on all its sides, open below, with legs so that the thermometer-bulbs are four feet above the ground, the whole painted white, and, if possible, standing on an open grass-plot (Fig. 3).

The sun's rays are practically our sole source of heat;* but their action is not, in the first instance, to warm the air. Just as a glass fire-screen stops the "dark" heat rays from a fire whilst a glass window stops but little of the sun's heat, so the atmosphere, and especially its moisture-laden lower layers, while largely diathermanous to the direct solar radiation, stops and is heated by the "dark" rays from the earth. We require instruments, therefore, both to measure solar and terrestrial radiation, neither of which wants is very satisfactorily supplied. The length of time during any one day in which unobscured sunshine occurs is readily measured by J. F. Campbell's sunshine-recorder, a very simple instrument (Fig. 4). It is a glass sphere acting as a burning-glass on a strip of prepared cardboard divided like a watch face, the length and intensity of the scorching giving the time the sun shines. It gives, however, no measure of the intensity of solar radiation, which may be estimated either by Herschel's ***actinometer***, a bulb-tube filled with an ammoniacal solution of copper, or, as it is now more commonly done, by the ***black-bulb thermometer*** in vacuo (Fig. 5). This is usually in Britain exposed four feet above the ground, horizontally, with its bulb towards the south-east, and the maximum shade temperature subtracted from the maximum registered by it is taken as the solar radiation maximum. In very dry climates, temperatures above 212° may thus be recorded, more than 150° occurring even in Britain. Terrestrial radiation is measured by a minimum thermometer with its bulb just level with the tips of the grass. Except in very wet fogs, such a thermometer will give lower readings than that in the screen.

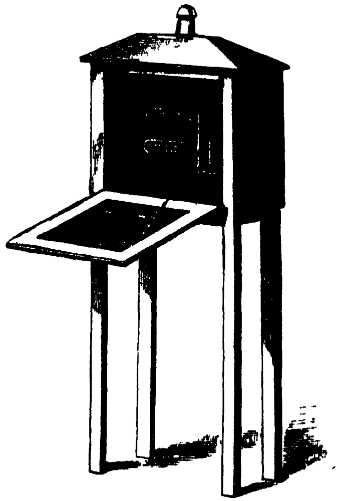

Fig. 3.—Stevenson's Thermometer Screen.

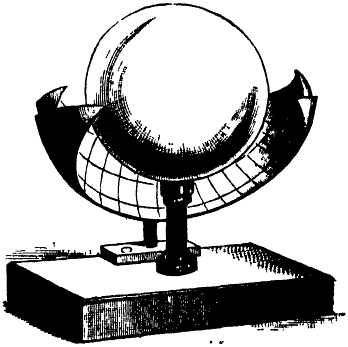

Fig. 4.—Campbell's Sunshine Recorder.

"The amount of heat received from the sun increases hour by hour from his rising until noon, and then decreases again till sunset, while all night long we receive no heat at all from him. The radiating power increases almost *pari passu* with the increasing heat, but cannot quite keep pace with it, and so the day grows warmer as it wears on. The heat received begins to decrease when noon is passed, but the amount given off does not equal that received for about two hours, and, accordingly, the hottest part of the day is about 2 p.m. The coldest is just before sunrise, because then the influence of solar heat has been withdrawn for the longest possible period, while the earth all the time has been radiating heat out into space. If we apply a similar train of reasoning to the yearly period we shall understand how it is that the hottest month in these latitudes is not June, but July, and the coldest not December, but January. The common saying 'As the day lengthens the cold strengthens' expresses this fact."*

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* Dr. Haughton calculates the heat received from the interior of the earth at $\frac{1}{1101}$ of that received from the sun.

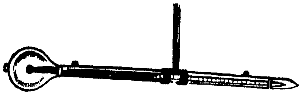

Fig. 5.—Black-bulb Thermometer.

So dependent, however, is the diurnal range of temperature upon terrestrial radiation that it is barely perceptible either in cloudy weather or on the open sea under the equator, whilst, as we might expect, it is non-existent during the prolonged "night" of polar regions.

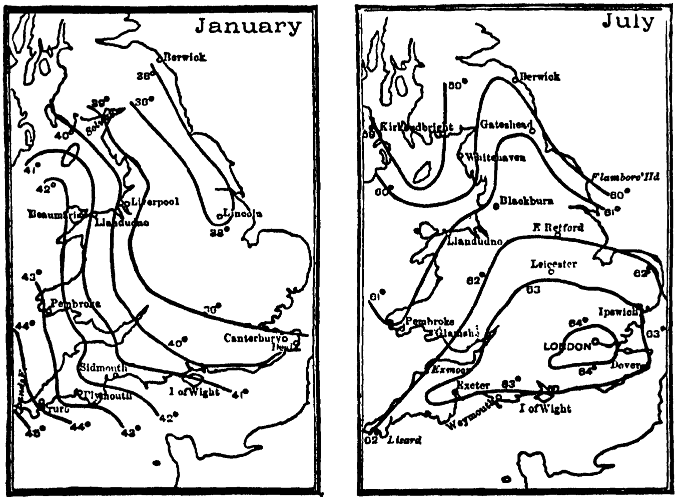

Fig. 6.—Synoptic Charts Showing Isotherms for January and July.

When we take into consideration the various local causes modifying temperature (*see* Vol. I., p. 144), we can understand that the *isotherms*, or curves uniting places having the same temperature, will not be simple parallel latitudinal lines (Fig. 6). Of these causes the chief are those to which we have already called attention, the irregular distribution of land and water, the specific heat of water being five times that of dry land, the radiating power of water being less than that of land, the action of winds and ocean-currents, and the latent heat of water. In passing from a solid to a liquid form water requires, merely to liquefy it, without raising its temperature, as much heat as would suffice to raise the same bulk of water (when already liquid) through more than 142° F. Thus to melt a layer of ice only 1½ inches thick requires as much heat as will raise a stratum of air 800 feet thick from 32° to 88°. The same amount of latent heat will be liberated on the return of the water to the condition of ice, thus moderating the rigour of the cold and prolonging the autumn in high latitudes just as the melting of the ice delays the spring. From these causes it follows that land near the equator raises the mean temperature or deflects the isotherms polewards, whilst near either pole it lowers temperature, or deflects isotherms towards the equator; and, conversely, equatorial oceans lower, and polar oceans raise the mean temperature. (*See* Map of the World with isotherms, Vol. II., opposite p. 164.)

The constant action of ocean-currents in the transfer of heat was described in our lessons on Physical Geography (Vol. I., pp. 264, 265), and the less constant action of atmospheric currents or winds, to which we shall have another occasion of referring, on pp. 145 and 146 in the same volume. "Without ocean-currents," says Dr. Croll, "the globe would not be habitable."

We cannot here trace the course of the various isotherms across the globe, but it should be remembered that to form any adequate notion of the annual distribution of temperature, it is necessary to notice not only the annual means, but also the winter and summer extremes, as these make the difference between *equable* or *insular* and *extreme* or *continental climates*.

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* R. H. Scott, F.R.S., "Elementary Meteorology."

ATMOSPHERIC PRESSURE: ITS MEASUREMENT AND DISTRIBUTION.

Actual weighing of vessels, when exhausted by an air-pump and when not so exhausted, will convince us that air has weight. Thirteen cubic feet of air weigh about 1 lb. avoirdupois, so that the air in Westminster Hall has been calculated to weigh nearly 75 tons.

Having weight, the atmospheric ocean of unknown depth, at the bottom of which we live, necessarily exerts pressure—a pressure transmitted like that of other fluids equally in all directions, and therefore generally counteracting itself, so to say, and not perceived by us. If, however, we imitate Torricelli in his experiment of 1643 (*see* Vol. I., pp. 142, 143) by inverting an exhausted tube over a liquid, we relieve part of the surface of the liquid from atmospheric pressure, and the liquid will rise in the tube, forming a column the height of which will depend on the specific gravity of the liquid, whilst its weight will be equal to that of a column of air of the same calibre. Atmospheric pressure is about 14·7 lb. to the square inch, a cubic inch of water weighs 252·5 grains, and one of mercury 13·59 times as much. Thus a column of water 34 feet high, or one of mercury 30 inches, will counterbalance the atmosphere. This is the principle of the *barometer*, as Torricelli's instrument was named by Robert Boyle, and fluctuations in the height of the mercury in the barometer represent fluctuations, variously produced, in the local pressure of the atmosphere. To measure this varying atmospheric pressure, the barometer is graduated, preferably on a brass scale, into inches and twentieths; but, as all readings at sea-level will range between 26 and 32 inches, it is unnecessary to have it graduated through the whole length of the tube. For more accurate readings the small movable scale, called, from its inventor, a *vernier*, is attached to the barometer. Its principle is that n divisions of the barometer scale are equal to $n+1$ divisions of that of the vernier. English barometers are divided into twentieths of an inch, so that 24 of these being equal to 25 divisions on the vernier, one of the former spaces is two-thousandths of an inch larger than one of the latter.

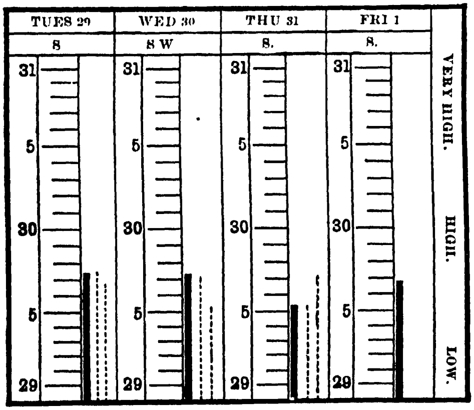

Fig. 7.—*Daily News* Barometric Report, January 1st, 1892. *Corrected to sea-level and reduced to 32 deg. F.*

The black lines show the height of the barometer at 1 o'clock on this and three previous mornings. The dotted lines indicate the extreme variations during yesterday and the two previous days. The initial letters show the direction of the wind.

The Times Office, 2 a.m.

Readings of the Jordan Barometer (corrected) during the past twenty-four hours.

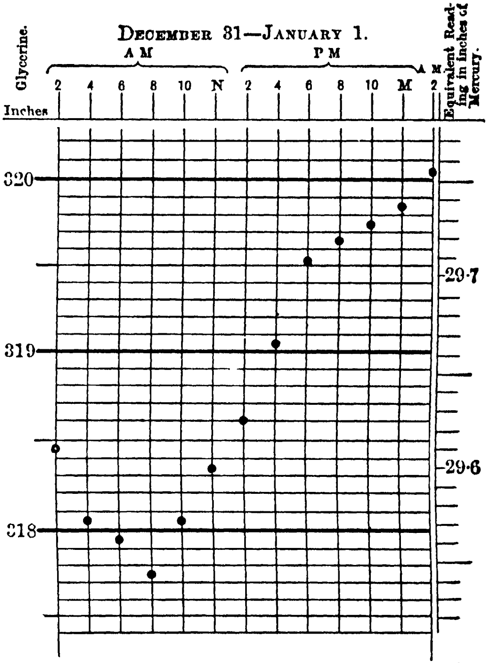

Fig. 8.—*Times* Barometric Report, January 1st, 1892.

As the mercury in the barometer will expand when heated, the reading has to be "corrected for temperature" or "reduced to 32°" by calculation, or rather by the use of previously calculated tables; and, similarly, it has to be "corrected for altitude" or "reduced to sea-level," *i.e.*, Ordnance Datum, the mean half-tide level at Liverpool, as the barometer is approximately 0·1 inch lower for every 90 feet of ascent. Any corrections for individual instruments for each half-inch of their scale are made, as at Kew, by comparison with a standard.

Aneroid barometers, though conveniently portable and compensated for temperature, cannot be relied on for any length of time. The use of glycerine instead of mercury, as in Mr. Jordan's instrument at the *Times* office, by magnifying the scale more than ten times, shows the fluctuations more strikingly.

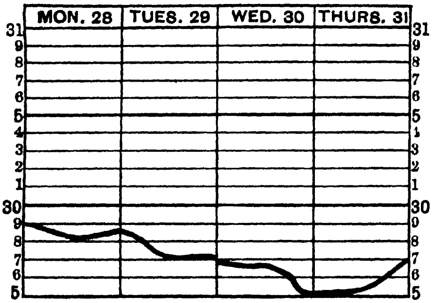

Fig. 9.—*Daily Telegraph* BAROMETRIC REPORT, JANUARY 1ST, 1892.

The above chart represents the movement of the barometer, corrected for sea-level and reduced to 32 deg. F., during the last four days ending midnight, Dec. 31—Jan. 1.

With ordinary barometers atmospheric pressure can only be recorded at the various hours of observation, as in the case of the daily black lines in the reports published by the *Daily News* (Fig. 7) and in the two-hourly records at the *Times* office (Fig. 8); but there are various continuously self-recording instruments, or *barographs*, in use, and the curves traced by them, such as those published by the *Daily Telegraph*, are called *barograms* (Fig. 9). The Meteorological Office, for instance, photographs on a continuous ribbon of paper the actual height of the mercury by admitting light through the Torricellian vacuum. Another most ingenious barograph, that of King, has its tube suspended from the arm of a balance and counterpoised, so that any increase or decrease in its weight, by the rise or fall of the mercury, will cause it to sink or rise in the cistern of mercury, and to move a pencil in so doing.

There is a regular diurnal range of the barometer, largely dependent on those fluctuations of temperature which are clearly seen in the thermogram of a clear day; but, except in the tropics, it is so slight as to be altogether masked by the non-periodical or storm oscillations. The measure of the rapidity with which the mercury rises or falls is called the *barometric rate*. It is usually expressed in hundredths of an inch of mercury per hour, and in the climate of Britain is low if under 0·02 in. and high if over 0·05 in., seldom exceeding 0·10 in.

BRITISH COMMERCE.—IV.

[*Continued from p.* 108.]

IVORY.

THE chief sources of our ivory supplies are Africa, the British East Indies, Holland, and France. These countries contribute, out of a total import of 14,349 cwt. of the value of £755,164, 11,099 cwt. valued at £596,572.

Ivory is equivalent to the hard substance known as dentine, and of which teeth are mostly composed. It is only teeth, however, that are sufficiently large to be handled with profit that are drawn upon for industrial purposes. Hence, in commerce, ivory is confined to the tusks of the elephant, the hippopotamus, the walrus, the narwhal, and the sperm whale.

The teeth of the hippopotamus, or river-horse, that are drawn upon for ivory are the incisors and the canines. At one time the canines of this animal were largely used by dentists in the manufacture of artificial teeth. They are still the best article known for the handles of surgical instruments by reason of their little liability to take on stains. In some kinds of delicate carving, too, they are preferred to elephant ivory. The incisors of the hippopotamus are manufactured into ladies' long knitting needles and netting meshes.

The African elephant ivory is the best, and the best of that comes from near the equator. In this region, though the animals are smaller, yet their tusks are larger, and the value generally depends upon the length of the tusks, inasmuch as the larger the tusks, the larger the articles that can be made from them. It is supposed that the size of the tusks in the equatorial elephant is due to the greater age of the animals, they being subject to less disturbance here than further south. The centre of the African ivory trade is Zanzibar, though considerable quantities also come by way of the Cape and Natal. Caravans also transport it across the desert to North African ports, whence it finds its way into the markets of the world from Alexandria, Tripoli, Tunis, and Cairo.

Asiatic ivory is inferior in size, and is more easily discoloured than African. While 175 lb. is not an uncommon weight for an African tusk, the largest Indian growth does not attain to half that. From Cochin-China, however, come tusks that reach 150 lb. It is only the male Asiatic elephant that yields tusks sufficiently large to have any commercial value. In Africa, the tusks of both sexes enter into commerce, the male being the larger.

The ivory from the walrus, which is supplied from the pair of tusks that grow in the upper jaw and descend outside the lower jaw, lacks density and is far less valuable than any of the preceding. A pair of such tusks weighs about 4 lb., and acquires a length of 2 feet. They are captured by whalers mainly on the Alaska coast, and a market is found for the bulk of the ivory in China.

The narwhal ivory is from the left tusk of *Monodon monoceros*, an inhabitant of the Arctic seas. Only the left tusk of the male enters into commerce, the right being in a rudimentary state only. It reaches a length of 10 feet, is of coarse texture, and of comparatively little value in commerce.

Fossil ivory is found in Siberia and Alaska. It is the tusks of the extinct mammoth, a pair of which has the average weight of 200 lb. The defect in this ivory is its brittleness.

With us, the chief uses to which ivory is put are the manufacture of razor and knife handles, billiard balls, chessmen, combs, piano-keys, brush backs and handles, fancy drinking cups, cabinets, and other articles. The greatest quantity, however is consumed in the cutlery trade. It is cut into the requisite shapes by means of a horizontal saw, the fragments and dust being carefully preserved. This refuse, by being burnt in air-tight vessels, and so made into a kind of charcoal, yields the finest black colour. By boiling, again, it may be made into a jelly that rivals calf's-foot jelly and that does not deteriorate from keeping.

The quality, and consequently the price, of ivory is dependent on the size and soundness of the tusks, which in commerce are sorted into those of 60 lb. and upwards, those between 40 lb. and 60 lb., and those between 20 lb. and 40 lb. Below 20 lb. they receive the name of "scrivelloes," and are devoted principally to the production of billiard balls. As to price, the African ivory, which is the best, has averaged during the past ten years £50 per cwt. Specially selected teeth, however, may bring more than £100 per cwt.

VEGETABLE IVORY.

is made from the corozo nut of commerce, the fruit of the palm-like plant *Phytelephas macrocarpa*, which grows in South America. The nuts are the seeds of the plant, and are somewhat similar in shape to a Brazil nut, though larger and so hard that they will break a stone used to break them. They are successfully used to imitate ivory, and are worked up chiefly by London and Birmingham turners into buttons, umbrella handles, and articles of a fancy description. The imports of vegetable ivory, which are chiefly from Chili and Colombia, are 102,879 cwt., of the declared value of £54,755.

HORNS AND HOOFS

are imported into this country to the extent of 5,360 tons yearly, representing a value of £158,971. In addition to this, there is used for manufacturing purposes the produce of our own animals, The chief supplies come from the British East Indies, United States, Australasia, and France: these countries sending respectively 1,486 tons, worth £61,049; 798 tons, worth £12,016; 654 tons, worth £17,616; and 538 tons, worth £15,707.

The most valuable horns are those from the African ox, the Java buffalo, and the Arnee buffalo of India. Hoofs, though similar to horns, are less valuable because less easily worked, and are devoted chiefly to the manufacture of buttons and cheap combs. The horns and hoofs that mainly enter into industry are those of oxen. Horn tips, which are solid, are used by cutlers and button-makers. The sheaths are converted into a great variety of articles —such as drinking-cups, combs, knife-handles, shoe-horns, powder-horns, snuff-boxes. Horn is easily dyed, and in this country is usually made to resemble tortoise-shell. Fragments resulting from the process to which it is subjected in manufactures are melted and moulded into different shapes, thus supplying us with bell-handles, handles of table knives and forks, drawer-knobs, and such like; or they may be subjected to different treatment, and made to yield prussic acid.

From the antlers of deer are made also knife-handles of a superior kind, and from the shavings arising from their manufacture is made ammonia, which is thus popularly called "hartshorn."

WHALEBONE

is, strictly speaking, not bone at all. It is rather a number of hardened hairs adhering together by means of a gum. The whale from which it is mainly derived is the Greenland whale (*Balaena mysticetus*), for which it does duty as a sieve or strainer in catching its prey, pretty much as a net does duty for the fisherman. In the whale's mouth it depends from the upper jaw, and is arranged in flat plates of about 12 feet long, 10 or 12 inches broad, and about ½ inch thick. In a full-grown whale the weight of these plates, which number about 300 on each side of the mouth, is upwards of a ton and a half, and they furnish at least one ton of saleable whalebone. The material usually arrives in pieces comprising about a dozen of these plates, which are first cleaned and softened by boiling and then planed into sizes according to the uses it may be meant for.

Of whalebone in this form, the amount imported in 1890 was 4,994 cwt., of the declared value of £163,455. The chief contributary was Norway, with 1,398 cwt., worth £12,975; other leading countries being France, Denmark, and Holland.

The qualities which confer upon whalebone its high value are its elasticity and strength combined with flexibility and lightness. It is chiefly used for the ribs of umbrellas and parasols and stays. The fibres that become separated in planing the blades are used to make brushes with, in stuffing mattresses and cushions instead of hair, and in filling fire-grates in summer. In thread-like strips it is used as a covering for whip-handles, walking-sticks, and telescopes, and plaited into hats. Thick portions, again, provide knobs for walking-sticks and snuff-boxes.

FEATHERS

are used for the stuffing of beds and for decoration. Of ornamental feathers, our imports in 1890 were 804,666 lb. 6 oz., of the declared value of £1,056,657: France sending 317,995 lb. 4 oz., worth £377,683; South Africa, 248,902 lb. 9 oz., worth £551,396; and the British East Indies, 101,367 lb. 2 oz., worth £41,347. The queen of ornamental feathers is the ostrich feather, and the best of this class come from the back and above the wings of the living bird. These, dyed black, furnish the mourning plumes of undertakers, and may cost as high a sum as £300. From seven to eight guineas a pound is the usual price of fine white ostrich feathers. The Americans are said to be able to manufacture artificial ostrich plumes.

The principal supplies of ostrich feathers come from Africa, and in South Africa ostrich farming for the sake of the feathers has become an extensive industry. The plumes are gathered every eight months, and are either plucked or cut off near the base with a sharp knife. The latter method is the one now generally adopted, as, though it lessens the weight of the feathers, it is not so injurious to the birds. There are many other birds whose feathers are valuable as ornaments.

Of feathers for beds, our imports were 30,411 cwt., of the declared value of £108,547. From Germany came 9,174 cwt., worth £51,344; France, 8,736 cwt., worth £22,084; and from China, 7,489 cwt., worth £16,218. The feathers best suited for this purpose are those of ducks, geese, and swans, on account of their downiness and absence from hard stems. They arrive here in bales full of impurities. To cleanse them, they are first dried, then beaten with sticks, and sieved. Thereafter they are passed through hot stoves to destroy vermin and other animal germs. This process also adds to their appearance.

The down of the eider duck is the most valuable of the feathers used for stuffing, and in Iceland and Norway eider duck farming is as regular an industry as ostrich farming in South Africa. The duck lines its nest with down plucked from its own breast to keep its young warm; the farmers remove a portion of the down, which is replaced by an additional plucking. This is done three times in the year, and the result is 3 oz. of down from each nest. The down thus gathered is sorted and cleansed, sewn up into little bags about the size of a man's fist for export, each weighing about three pounds. So fine and soft is this down that the contents of one of these bags, spread out and warmed over hot coal, are said to expand sufficiently to fill a bed big enough for two persons. Eider down, however, is not used for beds except as coverlets, as, when lain upon, it loses its elasticity. There are many inferior imitations of it in the market, the spurious article being detected by its much greater weight. For a bed coverlet 1½ lb. of eider down is usually sufficient; made with other down, the weight would be three times greater.

PETROLEUM.

Our imports of this useful article are yearly increasing. In 1888 they amounted to 94 million gallons, in 1889 to over 102 million gallons, and in 1890 to over 105 million gallons, of the declared value of £2,397,187. The great petroleum-yielding country is America, whence came in 1890 70,903,026 gallons, worth £1,719,654; and next is Russia, which sent us 33,103,280 gallons, worth £632,343. Rock-oil and naphtha are names sometimes applied to this substance.

Besides the countries named, Russia and America, petroleum is also found in this country, in France, Germany, and Italy. The chief parts of Russia yielding this oil are Baku and Kertch. The extent to which it is present in the region of the Caucasian mountains is quite unknown, borings made having nearly always been successful. It is in America, however, that the petroleum industry has reached its highest development, and here the oil is transported from the wells to the rail or ship through tubing, one pump sending the oil a distance of 15 miles.

In the working of petroleum great care has to be taken against fire, and many ingenious constructions have been devised to this end. In storing the oil, for instance, though tanks surrounded with water were sufficient protection against fire as ordinarily caused, yet they were unavailing against lightning. Even lightning-proof tanks, however, are now produced.

The crude petroleum, the petroleum as it comes from the earth, is dark-coloured and somewhat thicker than common tar. To prepare this for commerce, it is distilled and so separated from:—(1) the highly volatile and inflammable light oils; (2) the heavy oils, which are bad luminants but good for lubricating; (3) tarry substances; (4) colouring substances; and (5) bad-smelling substances. The products ultimately derived from the crude petroleum are: cymogene, used in artificial freezing; rhigolene, used as an anæsthetic; gasolene, consumed in air-gas lamps; naphtha, devoted to different purposes; benzine, used in paints and varnishes; kerosene, lamp-oil; paraffin-oil, ultimately further separated into paraffin and a lubricating oil; and vaseline, which is the highly purified residuum left after the distillation of the petroleum.

ASPHALTE OR BITUMEN

is imported to the extent of 19,490 tons, of the declared value of £54,342. From French ports come 9,383 tons, worth £26,693; from the West India islands 3,747 tons, worth £10,575; and from Germany 2,768 tons, worth £8,073. It is put to various uses, such as for making roofs and floors waterproof; but the bulk of it is consumed in the construction of roads and pavements—especially is this the case with that found at Val de Travers in Switzerland. It is supposed to be organic matter decomposed under the earth's surface, water being present but air absent.

It takes its name from *Lacus Asphaltites*, or the Dead Sea, where it was formerly found in large quantities. There is a lake of it in Trinidad which presents some striking features. For instance, at the edge the lake is hard and cold; towards the centre, however, it becomes warm and soft; while at the centre it is boiling.

The Val de Travers mine already mentioned, whose product is the best and most widely known in this country, was discovered in 1710 by a Greek professor, D'Eyrinis, and remained for a long time the only available source of asphalte. In 1838 the first asphalte pavements were constructed in Paris, and, later, it became much used there for the roadways, the authorities considering it preferable to stones because in popular risings it would not furnish material for barricades. The first rival to Val de Travers was the Seyssel mine on the Rhone, and no better asphalte is found than the produce of these mines.

In extracting the asphalte the process of blasting is resorted to, as in the quarrying of other rocks. After extraction it is broken up into a powder and sieved. This powder is then boiled in large sheet-iron boilers and converted into mastic. After boiling it is ladled out into moulds, and, when cool, solidifies into blocks—each block being about ½ cwt.

COFFEE

was imported in 1890 to the extent of 864,454 cwt., of the declared value of £4,004,490, and mixed with chicory to the extent of 222,731 cwt., of the declared value of £8,115. The duty on pure coffee in the raw state is 1½d. per lb., roasted 2d. per lb., and mixed with chicory 2d. Central America and Brazil contribute, respectively, 224,723 cwt. at £1,159,566, and 221,284 cwt. at £852,173, the bulk of the remainder coming from the British East Indies. Of coffee mixed with chicory the main supplier is the Channel Islands.

There are many different varieties of the coffee-plant, but the one that supplies almost the whole of the coffee of commerce is *Coffea Arabica*. It is an evergreen shrub, and attains a height of from 15 ft. to 20 ft. The berries are the part that is used, and these are gathered when they assume a crimson colour. Sometimes they are picked from the plants and often they are shaken off, mats being spread underneath to receive them. They are then gathered into sacks to be conveyed to the curing-houses or, in some cases, they are washed thither down galvanised iron tubing. The first process that they undergo is known as pulping, which consists in separating the pulp enveloping the beans. Fermentation is next allowed to supervene to remove the saccharine from the beans, which are thereafter dried. After this, various minor operations such as fanning and sizing are gone through, and then the coffee is packed in air-tight casks or in bags, which are not so good, and then shipped.

Such is raw coffee, which before being used is roasted in a hollow iron cylinder, kept turning for half an hour over a fire until the berries become brown. This enhances the flavour of the beans and also their strength as a stimulant. Coffee is very much subject to adulteration. Chicory is the most common adulterant, and when added in small quantities is considered by some to improve the flavour and to assist digestion. Figs have also been roasted and pulverised and offered as coffee, as has also the date. The coffee-leaf itself is sometimes used as a substitute for tea.

The best coffee, Mocha, comes from Yemen in Southern Arabia, being shipped principally from the ports of Loheia and Mocha. The high reputation attained by this coffee in Europe is said not to be due to superior cultivation or improved stock, but to the circumstance that the coffee was first shipped to India, and thence by circuitous ways to European markets, it being thus two or three years old before it reached the consumer. Nowadays it is subject to considerable adulteration, and it is said that genuine Mocha is never seen westward of Constantinople.

TEA

was introduced into Europe by the Dutch. There is some doubt as to the date of its first appearance in England. One account places it as early as 1615, relying on a letter from a servant of the East India Company, wherein a pot of the best sort of "chaw" is requested. Others put the date at 1652, and in 1660 Pepys records in his diary:—"I sent for a cup of tea, a Chinese drink, of which I had never drunk before." In or about the same year a pamphlet, accidentally discovered some years ago in the British Museum, was issued by Thomas Garway, the founder of Garraway's famous coffee-house in Exchange Alley, and professes to give "an exact description of the growth, quality, and virtues of the leaf tea." As to its virtues, the writer of this pamphlet declares them to be "evident and manifest by the high esteem and use of it among the physicians and knowing men of France, Italy, Holland, and other parts of Christendom, while in England it hath been sold in the leaf for six pounds, and sometimes ten pounds for the one pound weight." "And to the end," he further adds, "that all persons of eminency and quality, gentlemen and others, who have occasion for teas in leaf, may be supplied, these are to give notice that the said Thomas hath tea to sell from sixteen to fifty shillings in the pound."

In 1675, the imports of tea amounted to 4,713 lb., but the taste for it was so restricted or the price so prohibitive, that this quantity overstocked the market for seven years. Ten years later, however, the imports had nearly tripled, and in the early years of the eighteenth century reached upwards of 90,000 lb. By the middle of the century, with lessened imposts and a growing taste for "the cup that cheers but not inebriates," the yearly imports attained the high figure of over 2½ million lb., while at the end of the century, advancing with enormous strides, they had become more than 25 million lb. During the present century, the tea trade has never ceased to advance, and now the total imports have arrived at the enormous figure of 223,494,511 lb., representing a money value of £9,919,666. Of this, 37,297,599 lb. were re-exported and 194,009,063 lb. were consumed at home. The countries from which these supplies are drawn are China, including Hong Kong and Macao, and British East India, including Ceylon; the former sending 73,635,351 lb., and the latter 146,260,642 lb

Formerly, our teas were drawn exclusively from China, and were known in commerce as belonging to one or other of the divisions black or green tea. Green teas, according to Dr. Yeats, comprise Twankay, so named from a stream in the neighbourhood where this variety is grown; Hyson, meaning "before the rains," the period of the year at which this variety is gathered; Gunpowder, or *ma-chu*, "hemp-pearl," referring to the globular form into which the leaves are twisted; Imperial, named from the fact that only the Emperor and the mandarins consume it, and consisting of the smallest and most tender of the light-green leaves of the first gathering. "The black teas," according to the same authority, "include Bohea, named with reference to the Bu-i hills. where it is grown; Congou, or *koong-foo*, signifying labour or assiduity; Souchong, or *sian-chung*, meaning small or scarce sort; and Pekoe, or *pe-kow*, 'white hairs,' in allusion to the down on the epidermis of the young spring leaves. The two last are the finest and most expensive of the black teas.

"The preparation of green tea may be described in general terms as follows:—The leaves are gathered from the shrub, and placed in bamboo baskets; they are then put into shallow iron pans, placed over charcoal fires, and stirred continually and briskly, the rising steam being fanned away; after this they are removed from the pans, and whilst still flaccid with the contained moisture, are placed before the twisters, on a table made of split bamboo, and therefore presenting ridges; the twisters roll them over with their hands until twisted. The leaves are then spread out and exposed to the action of the air, and afterwards returned to the drying-pans, exposed there to additional heat, and kept continually stirred until the drying is complete, when they are picked, sifted, sorted, and so prepared for packing. Black tea is prepared in the same manner, with this difference, that the fresh leaves, as soon as collected, are thrown together into heaps, and allowed to lie until a slight degree of fermentation ensues. or a spontaneous heating, similar to that which takes place in a damp haystack. This partial fermentation of the tea-leaves darkens their colour."

In India the tea-leaf goes practically through the same processes as in China, only these processes are performed by machinery when possible and when thought to be advantageous. Astonishing as has been the growth of the tea trade as a whole, still more astonishing has been the growth of the trade in Indian and Ceylon teas. The first consignment of Indian tea, amounting to 5 lb., was sent to London from Assam in 1835. In 1865, the consumption of this tea in this country was 3,000,000 lb., and in 1888 it exceeded for the first time the consumption of China tea—the figures being 87,000,000 lb. to 79,000,000. Still more rapid has been the advance of Ceylon tea. In 1880, the year in which the importation of Ceylon tea may be said to have commenced, our consumption was 115,000 lb., which in five years grew to 3,000,000 lb., the total import being 4,353,000 lb. In 1890, the imports of this tea reached the high figure of 42,491,112 lb., an increase of just upon 370-fold. The rapid displacement in our markets of China teas by Ceylon and Indian teas is assigned to different causes—to the greater strength and, consequently, greater economy of the latter, to the desire to encourage the industries of our own possessions, to the greater enterprise of British-managed plantations as against the slow-going, innovation-hating Chinese, and to the fact that the Chinese abused their long enjoyed monopoly by resorting to the use of adulterants. Whichever of these causes is the correct one, the truth possibly being in a mixture of them all, the fact remains that the Indian and Ceylon teas are rapidly monopolising the English markets.

The entire tea trade of Britain is carried on from London, and the centre of the trade in London is Mincing Lane. Here are the establishments of the importers, brokers, and dealers, and here all cargoes of tea are sold. The importer or merchant buys the tea abroad, shipping it to London, where it is stored in one or other of the twenty bonded warehouses to await the process of sampling. "The broker, acting for the merchant, who does not appear upon the scene, deals with the tea from the moment of its coming into the London warehouses. The great bulk of the imports are sold by public auction. Sales take place on the first four days of the week, and are carried on from 11 in the forenoon to 3 in the afternoon. Nothing can be more bewildering to a stranger than the bustle and excitement of the sale. On an average about 10,000 chests are sold each day. The dealer or distributor looks at all samples offered by the brokers, attends the auctions, and when his selections and purchases are made, offers the samples to the trade at all the local centres throughout the kingdom. Before any transaction is completed, the dealer pays a heavy deposit (amounting on the average to one-third of the whole of the purchase-money) to the importer, and then, before a single chest of tea can be removed, the balance of the purchase-money must be paid in cash."—*Tea: its Natural, Social, and Commercial History.*

There are many other aspects of this great trade that might be treated. We shall content ourselves, however, with the following, from the work already quoted:—"The year 1865, when the duty was reduced to 6d. (previously it was 1s. 5d. per lb., now it is 4d.), may be regarded as a turning-point in the tea trade. Since then its conditions have quite altered, and new forces have come into action. The first effect of the reduction of the duty was to inaugurate a period of the fiercest competition between the wholesale dealers. They altered the terms on which they transacted business. Instead of requiring cash from their customers, as had been formerly the case, they offered extensive inducements of credit to local traders in every part of the kingdom. This, no doubt, stimulated a certain kind of business, but whether its effects have been beneficial is open to question. It led, among other things, to the rise of picturesque forms of trading, by which gifts of all kinds, lotteries, and systems of insurance were identified with the distribution of tea. Shops for the exclusive sale of tea were established. Large quantities were also distributed by the co-operative stores, and the sale of tea ceased to be a grocer's monopoly. If we may judge by their complaints, the results so far have not been particularly satisfactory to the large London dealers any more than the grocers. The reduction of the duty had, however, a more important effect. It led to the foundation of the packet and wholesale blended tea business. This trade has gradually grown in importance, and has exercised a considerable influence on the large dealers and grocers."

GREEK.—XXI.

[*Continued from p.* 108.]

VOCABULARY.

Ἅμα, at the same time, together with.
Ἀναρπάζω, I snatch.
Ἄνεμος, -ου, ὁ, wind.
Αὔριον, to-morrow.
Ἐκνέω (Lat. *enăto*), I swim out.
Ἐκπλέω, I sail from, I sail away.
Ἐνάντιος, -α, -ον, opposite.
Ἡγέομαι, I lead, I believe.
Κατακαίω, I burn down.
Κόλπος, -ου, ὁ, a bosom, gulf.
Κρίσαιος, -α, -ον, Crisæan.
Ναυμαχία, -ας, ἡ (ναυς *and* μάχη), a sea-fight.
Πελοποννήσιος, ὁ, a Peloponnesian.
Πίστις, -εως, ἡ, faith, fidelity.
Στρατία, -ας, ἡ, an army, an expedition.
Συγχέω (Lat. *confundo*), I pour together, I put in confusion.
Σφαῖρα, -ας, ἡ (our *sphere*), a ball, a top.
Τιμωρία, -ας, ἡ, punishment, revenge.

EXERCISE 113.

Translate into English:—

1. Ἡ στρατία αὔριον ἐκπλεύσεται (ἐκπλευσεῖται). 2. Ἄνεμος βόῤῥας ἐνάντιος τῇ στρατίᾳ ἔπνευσεν. 3. Ἐν τῇ ναυμαχίᾳ τῇ ἐν κόλπῳ Κρισαίῳ οἱ Πελοποννήσιοι ἄνδρας τῶν Ἀθηναίων ἀπέκτειναν, ὅσοι μὴ ἐξένευσαν αὐτῶν. 4. Ὅταν οἱ πολέμιοι τῇ πόλει πλησιάσωσιν, οἱ στρατιῶται ἀναρπάσαντες τὰ ὅπλα θεύσονται πρὸς τὰς πύλας. 5. Πολλοῖς καὶ σοφοῖς ἀνδράσι κέκλαυσται τἀνθρώπινα, τιμωρίαν ἡγουμένοις εἶναι τὸν βίον. 6. Τίς οὐκ ἂν κλαύσειε τὸν φίλον ἀτυχῆ. 7. Οἱ πολῖται ἤλπισαν τοὺς πολεμίους φευξεῖσθαι. 8. Οἱ παῖδες σφαῖραν παιξοῦνται. 9. Συγκέχυκε νῦν τὴν πίστιν ὁ καθ' ἡμᾶς βίος. 10. Οἱ πολέμιοι τὰς τῶν Ἑλλήνων τάξεις συνέχεαν.

EXERCISE 114.

Translate into Greek :—

1. The army sailed away. 2. The army will sail away. 3. The north wind blows against the army. 4. All the winds blew against the expedition. 5. The soldiers thought they should run to the doors. 6. You weep for the unfortunate. 7. You will weep for the unfortunate. 8. The foes will flee. 9. Keeping company with children, thou wilt play. 10. Good men play, and are yet in earnest. 11. The foes will put the ranks of the soldiers into confusion. 12. The city has been burned down by the enemy. 13. The soldiers think that the enemy will burn down the city.

VERBS IN -ω WITH THE PRESENT STEM STRENGTHENED.

We have already seen that the present stem of several verbs is strengthened; which strengthening, however, does not extend beyond the present and imperfect. Besides the strengthening by a consonant, and the lengthening of the stem-vowel, there are others which must now be set forth.

I. *Verbs whose Pure Stem in the Present and Imperfect is strengthened by the insertion of ν before the termination.*

Observe that βαίνω lengthens the stem-vowel α into αι; ἐλαύνω, α into αυ; and πίνω, ῐ into ῑ.

(1) βαίνω, *I step, I go*, fut. βήσομαι, perf. βέβηκα, aor. ἔβην; passive in compounds, as παραβαίνομαι, perf. pass. παραβέβᾰμαι, aor. pass. παρεβάθην.

(2) ἐλαύνω, *I drive* (a chariot), fut. ἐλῶ, -ᾶς, -ᾶ, inf. ἐλᾶν, aor. ἤλᾰσα, perf. ἐλήλᾰκα; mid. *I drive from me, repel*, aor. ἠλασάμην, perf. pass. ἐλήλᾰμαι, inf. ἐληλάσθαι, aor. pass. ἠλᾰ́θην.

(3) πίνω, *I drink*, fut. πίομαι, aor. ἔπιον, imperat. πίθι, ἔκπιθι, inf. πίειν, part. πίων, perf. πέπωκα, perf. pass. πέπωμαι, aor. ἐπόθην.

(4) τίνω, *I atone for, I pay for*, fut. τίσω, aor. ἔτῑσα, perf. τέτῑκα, perf. pass. τέτισμαι, inf. τετῖσθαι, aor pass. ἐτίσθην; mid. τίνομαι, *I avenge, punish*, τίσομαι, ἐτῑσάμην.

(5) φθάνω, *I go before, I anticipate*, fut. φθήσομαι (more rarely φθάσω), aor. ἔφθᾰσα, and (rarely in prose) ἔφθην and ἐφθάμην, perf. ἔφθᾰκα.

Here belongs a verb whose pure stem ends in a consonant :—

δάκνω, *I bite*, aor. ἔδᾰκον, fut. δήξομαι, perf. act. δέδηχα; perf. pass. δέδηγμαι, aor pass. ἐδήχθην.

II. *Verbs whose Pure Stem in the Present and Imperfect is strengthened by the introduction of the Syllable νε before the termination.*

(1) βῡ-νέ-ω, *I stop up, I fill up* (construed with gen.), fut. βύσω, aor. ἐβῡσα, perf. pass. βέβυσμαι, inf. βεβῦσθαι, aor. pass. ἐβύσθην.

(2) ἀφικ-νέ-ομαι, *I arrive*, fut. ἀφίξομαι, 2 aor. ἀφῑκόμην, ἀφίκου, ἀφῐκέσθαι, perf. ἄφιγμαι, inf. ἀφῖχθαι, plup. ἀφίγμην, ἄφῖξο, etc.

(3) ὑπισχ-νέ-ομαι, *I promise*, aor. ὑπεσχ-όμην, imper. ὑποσχοῦ; fut. ὑποσχήσομαι, perf. ὑπέσχημαι. So ἀμπισχνέομαι or ἀμπέχομαι, *I wear, I have on*, fut. ἀμφέξομαι, aor. ἠμπισχόμην *and* ἠμπεσχόμην.

VOCABULARY.

Ἄκρος, -α, -ον, very high; τὸ ἄκρον, the height, summit.

Ἀποτίνω, I atone for, pay for, punish.

Γε, an enclitic, a strengthening participle, *ipse*. It affirms what has gone before, and adds something more.

Ἐκβαίνω, I go out, turn out—*that is*, prove *or* become.

Ἐκπίνω, I drink out, I drink up.

Ἐξελαύνω, I drive out.

Ἐφικνέομαι (with gen.), I attain to something.

Ἱμάτιον, -ου, τό, a garment.

Λυκοῦργος, -ου, ὁ, Lycurgus.

Μεθύω, I get intoxicated, I drink μέθυ (that is, wine not mixed with water).

Οὔτοι, certainly not.

Πολυτελεία, -ας. ἡ, costliness, splendour.

Σπάρτη, -ης, ἡ, Sparta.

Συμβαίνω, I go with, go together; συμβαίνει, it happens.

Συμπίνω, I drink with, together.

EXERCISE 115.

Translate into English :—

1. Τοῖς στρατιώταις ἐν τῇ στρατίᾳ πολλὰ κακὰ συνεβεβήκει. 2. Σοφοῖς ὁμιλῶν καὶ αὐτὸς ἐκβήσῃ σοφός. 3. Λυκοῦργος πολυτελείαν ἐξήλασε τῆς Σπάρτης. 4. Πολλοὶ συμπίοντες ἅπαξ γίγνονται φίλοι. 5. Ὁ μεθύων δοῦλός ἐστι τοῦ πεπωκέναι. 6. Οὐκ ἐκπίομαι τὸν οἶνον. 7. Τοὺς κακούργους οἱ θεοὶ ἀποτίσαιντο. 8. Οἱ πολῖται τοὺς πολεμίους ἔφθασαν εἰς τὴν πόλιν φυγόντες. 9. Ὁ λαγὼς ὑπὸ τοῦ κυνὸς ἐδήχθη. 10. Οὔτοι γ' ἐφίξῃ τῶν ἀκρῶν ἀνεὺ πόνου. 11. Αἱ γυναῖκες ἠμπέσχοντο καλὰ ἱμάτια. 12. Ὁ οἶνος ὑπὸ τῶν στρατιώτων ἐξεπόθη. 13. Ὁ φίλος ὑπέσχετό μοι ἀφίξεσθαι.

EXERCISE 116.

Translate into Greek :—

1. The woman put on beautiful garments. 2. The woman will put on beautiful garments. 3. The friends promised to come. 4. The general got into the city before the enemy. 5. The gods

punish evil-doers. 6. Many friends were drinking together. 7. Friends drinking together become enemies. 8. Many evils happened to my children as they came (*coming*) hither. 9. O that Apollo would punish that evil-doer!

III. *Verbs whose Pure Stem is in the Present and Imperfect strengthened by the insertion of* αν *(less often* αιν*) before the terminations.*

(*a*) *ἄν or αιν is introduced without any other change.*

All verbs of this kind form their tenses from a triple stem—namely, the present and imperfect from the strengthened stem, the second aorist from the pure stem, the future and perfect from a third stem which arises from the pure stem and an added ε, which in the inflection passes into η. The α in the termination -ανω is short.

1. αἰσθάνομαι, *I feel*, aor. ᾐσθ-όμην, αἰσθέσθαι; perf. ᾔσθημαι, fut. αἰσθήσομαι.
2. ἁμαρτάνω, *I miss the mark, fail, sin*, 2 aor. ἥμαρτον, fut. ἁμαρτήσομαι, perf. ἡμάρτηκαι, perf. pass. ἡμάρτημαι, aor. pass. ἡμαρτήθην.
3. ἀπεχθάνομαι, *I am hateful*, aor. ἀπηχθόμην, inf. ἀπεχθέσθαι, fut. ἀπεχθήσομαι, perf. ἀπήχθημα. (*I am hated*).
4. αὐξάνω (and αὔξω), *I increase*, fut. αὐξήσω, 1 aor. ηὔξησα (perf. ηὔξηκα), perf. pass. ηὔξημαι, fut. pass. αὐξήσομαι, aor. pass. ηὐξήθην.
5. βλαστάνω, *I sprout*, 2 aor. εβλαστον, fut. βλαστήσω, perf. ἐβλάστηκα *and* βεβλάστηκα.
6. δαρθάνω, commonly as a compound—καταδαρθάνω, *I sleep*, 2 aor. κατέδαρθον, fut. καταδαρθήσομαι, perf. καταδεδάρθηκα.
7. ὀλισθάνω, *I slip, I slide*, 2 aor. ὤλισθον, fut. ὀλισθήσω, perf. ὠλίσθηκα.
8. ὀσφραίνομαι, *I smell*, 2 aor. ὠσφρόμην, fut. ὀσφρήσομαι.
9. ὀφλισκάνω, *I am liable, I owe*, 2 aor. ὦφλον, fut. ὀφλήσω, perf. ὤφληκα, perf. mid. or pass. ὤφλημαι. Mark the double strengthening in ισκ and αν.

(*b*) *ἄν is added, together with the insertion of the nasal ν, before the characteristic consonant of the pure stem.*

Thus in λανθάνω, pure stem λαθ-, between α and θ, ν is introduced, forming λανθ-, to which αν is added, forming λανθαν-. The short vowel in the pure stem passes in the tenses (except the second aorist) into the corresponding long one: μανθάνω is an exception. The ν before a *p*-sound and a *k*-sound undergoes the usual changes.

10. θιγγάνω (pure stem θιγ-), *I touch*, 2 aor. ἔθιγον, fut. θίξομαι.
11. λαγχάνω, *I obtain by lot*, 2 aor. ἔλαχον, fut. λήξομαι, perf. εἴληχα, perf. mid. or pass. εἴληγμαι, aor. pass. ἐλήχθην.
12. λαμβάνω, *I take*, 2 aor. ἔλᾰβον, imperat. λάβε, fut. λήψομαι, perf. εἴληφα, perf. mid. or pass. εἴλημμαι, aor. mid. ἐλαβόμην, aor. pass. εἰλήφθην.
13. λανθάνω, *I lie concealed*, 2 aor. ἔλαθον, fut. λήσω, perf. λέληθα (*I am concealed*); mid. ἐπιλανθάνομαι, *I forget*, aor. ἐπελαθόμην, fut. ἐπιλήσομαι, perf. ἐπιλέλησμαι.
14. πυνθάνομαι, *I ask, inquire, learn*, aor. ἐπυθόμην, perf. πέπυσμαι, πέπυσαι, etc., fut. πεύσομαι.
15. μανθάνω, *I learn*, aor. ἔμᾰθον, fut. μαθήσομαι, perf. μεμάθηκα. The α, contrary to the rule, remains short.
16. τυγχάνω, *I hit the mark, I get, obtain* (with gen.), *it happens*, 2 aor. ἔτῠχον, fut. τεύξομαι, perf. τετύχηκα (ΤΥΧΕ-).

VOCABULARY.

Ἀγγελία, -ας, ἡ, message.	**Εὐεργεσία, -ας, ἡ**, a benefit.
Ἄγε, come! come then! (imperative of ἄγω, *I lead*).	**Ἐξαμαρτάνω**, I fail, sin. (Here the ἐξ strengthens the meaning.)
Ἀναστρέφω, I turn round (trans. and intrans.).	**Ἴδιος, α, -ον**, one's own.
Ἄνθεμον, τὸ, bloom, flower.	**Κάμηλος, -ου, ὁ *and* ἡ**, a camel.
Βούλευμα, -ᾰτος, τὸ, a counsel, determination.	**Καταδαρθάνω**, I sleep, fall asleep.
Βραχύς, -εῖα, -ύ, short.	**Λυγρός, -ά, -όν**, sad.
Γενναῖος, -α, -ον, of noble race, noble, brave.	**Ὀπίσω**, behind.
Δεῦρο, hither.	**Προσήκων, -ήκουσα, -ῆκον** (gen. -ήκοντος), seemly, suitable.
Δοκέω, I think, I am of opinion, I seem.	**Πως** (*enclitic*), in some way.
Ἔλπομαι (poet. of ἐλπίζω), I hope (ἐλπίς).	**Συμφορά, -ᾶς, ἡ**, an event (especially misfortune).
Ἐπαρκέω (with dat.), I help.	**Χθών, -ονός, ἡ**, the earth.
Ἐπιβούλη, -ῆς, ἡ, a plot.	**Χρύσιον** (diminutive of χρῦσος), τὸ, gold.
Ἐπιορκέω, I forswear myself, I swear falsely (with acc.).	**Ὡς**, as; ὡς τάχιστα, as quickly as possible, as soon as.

EXERCISE 117.

Translate into English:—

1. Λήσειν διὰ τέλους μὴ δοκείτω ὁ πονηρός. 2. Δίκαια δράσας συμμάχου τεύξῃ Θεοῦ. 3. Γράμματα μαθεῖν δεῖ καὶ μαθόντα νοῦν ἔχειν. 4. Ὁ βασιλεὺς τῆς πρὸς ἑαυτὸν ἐπιβούλης οὐκ ᾔσθετο. 5. Οἱ Πέρσαι τοῖς Ἕλλησιν ἀπήχθοντο. 6. Φίλιππος αὐτὸς ἀπεφαίνετο δῖα χρυσίου μᾶλλον, ἢ διὰ τῶν ὅπλων ηὐξηκέναι τὴν ἰδίαν βασιλείαν. 7. Οἱ στρατιῶται βραχὺν χρόνον κατέδαρθον. 8. Ὡς ὤσφροντο τάχιστα τῶν καμήλων οἱ ἵπποι, ὀπίσω ἀνέστρεφον. 9. Θεὸν ἐπιορκῶν μὴ δόκει λεληθέναι. 10.

Καλὸν μηδὲν εἰς φίλους ἁμαρτεῖν. 11. Μακάριος ὅστις ἔτυχε γενναίου φίλου.

EXERCISE 118.

Translate into Greek :—

1. The king is aware of the plot against him. 2. Who has not erred ? 3. Wise men do not err (*it is not of wise men to err*) twice in the same thing. 4. The wicked man is hateful to the good. 5. Being wicked, you will not lie hidden at last. 6. My brothers having learnt have wisdom. 7. The good will obtain good things. 8. The men fell asleep. 9. I slept a short time. 10. I have obtained noble friends. 11. I learn to bear misfortune. 12. He lay hid doing a wicked deed (that is, *he did a wicked deed, and was not found out*). 13. They hope to lie hid, being wicked (that is, *they are wicked, and hope not to be discovered*).

IV. *Verbs whose Pure Stem is in the Present and Imperfect strengthened by the addition of the two consonants σκ or the syllable ισκ.*

Σκ are appended when the characteristic of the stem is a vowel, and ισκ when it is a consonant. Most of the verbs whose pure stem ends in a vowel form the future, etc., after the analogy of pure verbs, as εὑρίσκω, fut. εὑρήσω (ΕΥΡΕ-). Some of these verbs, however, take in the present and imperfect a reduplication, which consists in the repetition of the first consonant of the stem with the vowel ι.

1. ἁλ-ίσκ-ομαι (ᾰ), *I am taken, captured* (used of a city), imp. ἡλισκόμην ('ΑΛΟ-) ; fut. ἁλώσομαι, 2 aor. ἥλων and ἑάλων, *I was taken ;* perf. ἥλωκα and ἑάλωκα, *I have been taken.* The active is formed by αἱρεῖν, *to take, overcome.*
2. ἀρέσκω, *I please*, fut. ἀρέσω, aor. ἤρεσα, perf. mid. or pass. ἤρεσμαι, aor. pass. ἠρέσθην.
3. γηράσκω (or γηράω), *I grow old*, fut. γηράσομαι, 1 aor. ἐγήρᾱσα, inf. γηρᾶσαι, perf. γεγήρακα, *I am old.*
4. γιγνώσκω, *I learn, I know* (ΓΝΟ-), fut. γνώσομαι, 2 aor. ἔγνων (μι), perf. ἔγνωκα, perf. mid. or pass. ἔγνωσμαι, aor. pass. ἐγνώσθην.
5. διδράσκω, *I run away* (only in compounds, as ἀποδ-, ἐκδ-, διαδ-), fut. δράσομαι, perf. δέδρᾱκα, 2 aor. ἔδρᾱν (-μι).
6. εὑρίσκω, *I find*, 2 aor. εὗρον, imper. εὗρε ('ΕΥΡΕ-), fut. εὑρήσω, perf. εὕρηκα ; mid. *I procure*, aor. εὑρόμην, perf. mid. or pass. εὕρημαι, aor. pass. εὑρέθην.
7. ἡβάσκω, *I grow to maturity*, fut. ἡβήσω, 1 aor. ἥβησα, perf. ἥβηκα (ἡβάω, *I am young*, but ἀνηβάω, *I become young again*, rejuvenesco).
8. θνήσκω, commonly ἀποθνήσκω, *I die* (ΘΑΝ-), 2 aor. ἀπέθανον, fut. ἀποθανοῦμαι, perf. τέθνηκα (not ἀποτέθνηκα), 3 fut. τεθνήξω, *I shall be dead.*
9. θρώσκω, *I spring, leap*, 2 aor. ἔθορον, fut. θοροῦμαι, perf. τέθορα.
10. ἱλάσκομαι, *I propitiate*, fut. ἱλᾰ́σομαι, aor. ἱλᾰσάμην, aor. pass. ἱλάσθην.
11. μιμνήσκω (with gen.), *I remember* (ΜΝΑ-), fut. μνήσω, 1 aor. ἔμνησα, perf. mid. μέμνημαι (Lat. *memini*), subj. μέμνωμαι, -ῃ, -ῃται, imper. μέμνησο, plup. ἐμεμνήμην, opt. μεμνῄμην, -ῇο, -ῇτο, *or* μεμνῴμην, -ῷο, -ῷτο, 3 fut. μεμνήσομαι, aor. ἐμνήσθην, fut. μνησθήσομαι.
12. πάσχω, formed from πάθσκω (Lat. *patior*), *I suffer*, 2 aor. ἔπᾰθον (ΠΕΝΘ-), fut. πείσομαι, perf. πέπονθα.
13. πιπίσκω, *I drink*, fut. πίσω, 1 aor. ἔπῑσα.
14. πιπράσκω, *I sell*, perf. πέπρᾱκα, perf. mid. or pass. πέπρᾱμαι, inf. πεπρᾶσθαι, aor. ἐπρᾱ́θην, 3 fut. πεπράσομαι.
15. στερίσκω (and στερέω), *I deprive, rob*, fut. στερήσω, 1 aor. ἐστέρησα ; mid. and pass. στερίσκομαι, στεροῦμαι, fut. στερήσομαι, perf. ἐστέρημαι, aor. ἐστερήθην.
16. τιτρώσκω, *I wound*, fut. τρώσω, 1 aor. ἔτρωσα, perf. mid. or pass. τέτρωμαι, aor. ἐτρώθην, fut. τρωθήσομαι *and* τρώσομαι.
17. φάσκω, *I am of opinion, I give an opinion, affirm* (the indicative and imperative are very rare, the parts of φημί being used instead), imperf. ἔφασκον, fut. φήσω.
18. χάσκω, *I open the mouth* (ΧΑΝ-), 2 aor. ἔχᾰνον, fut. χανοῦμαι, perf. κέχηνα, *I stand open.*

Observe that διδάσκω, *I teach*, retains the *k*-sound in fut. διδάξω, 1 aor. ἐδίδαξα, perf. δεδίδαχα, aor. pass. ἐδιδάχθην.

VOCABULARY.

Ἄλυπος, -ον,	without grief, griefless.
Ἀμνημονέω (with gen.),	I have not in mind, I do not remember, I forget.
Δεκάς, -άδος, ἡ,	the number ten, a decade, or period of ten years.
Ἐξευρίσκω,	I find out, discover.
Ἐπαναφέρω (Lat. *refero*),	I bring back, refer to something.
Εὐγενής, -ες,	well-born, noble.
Μοῖρα, -ας, ἡ,	fate, lot.
Μόρσιμος, -ον,	determined by fate, fated.
Πάσχω εὖ,	I fare well, receive a favour.
Πενθέω,	I bewail.

EXERCISE 119.

Translate into English :—

1. Ὀλίγους εὑρήσεις ἄνδρας ἑταίρους πιστοὺς ἐν χαλεποῖς πράγμασιν. 2. Πᾶσιν ἀνθρώποις μόρσιμόν ἐστιν ἀποθανεῖν. 3. Πενθοῦμεν τοὺς τεθνηκότας. 4. Ἡδέως τῶν παλαίων πράξεων μέμνηνται οἱ ἄνθρωποι. 5. Οὐκ ἂν εὕροις ἄνθρωπον πάντα ὀλβιώτατον. 6. Ἢ

καλῶς ζῆν, ἢ καλῶς τεθνηκέναι, ὁ εὐγενὴς βούλεται. 7. Εἰ δεινὰ δι' ὑμετερὰν κακότητα πεπόνθατε, μή τι θεοῖς τούτων μοῖραν ἐπαναφέρετε. 8. Εἴ τις γηράσας ζῆν εὔχεται, ἄξιός ἐστι γηράσκειν πολλὰς εἰς ἔτων δεκάδας.

EXERCISE 120.

Translate into Greek:—

1. I have found no companion faithful in difficulties. 2. It is fated for thee to die. 3. I bewail my deceased father. 4. They will bewail the deceased general. 5. I gladly call to mind the great men of old (πάλαι). 6. I found no man very happy in all respects. 7. I wish to live honourably or to die honourably. 8. Through thy fellow thou wilt suffer much. 9. It is possible to discover many things, but not all. 10. Even the wise have not discovered a life devoid of grief.

V. *Verbs whose Pure Stem is strengthened by a reduplication at the beginning.*

This reduplication consists in the repetition of the first consonant of the stem in union with the connecting vowel ι. Only in a few verbs does the reduplication remain in the formation of the tenses. To this class belong—

γίγνομαι (instead of γιγένομαι), *I become* (ΓΕΝ-), aor. ἐγενόμην (ΓΕΝΕ-), perf. γεγένημαι, *I have become*, or γέγονα with a present meaning, as *I am* (but γεγονὼς χρόνος, *time past*), fut. γενήσομαι.

πίπτω (instead of πιπέτω), *I fall*, imper. πίπτε (ΠΕΤ-), fut. πεσοῦμαι, 2 aor. ἔπεσον, perf. πέπτωκα.

Here also belong several of the fourth class, as γιγνώσκω.

VI. *Verbs whose Pure Stem receives an ε in the Present and Imperfect.*

1. γαμέω, *I marry* (used of the man), perf. γεγάμηκα; but fut. γαμῶ, 1 aor. ἔγημα, mid. γαμοῦμαι, *I am married* (of the woman—in Lat. *nubo*), aor. ἐγημάμην, perf. pass. γεγάμημαι (Lat. *in matrimonium ducor*), aor. ἐγαμήθην, etc.
2. δοκέω, *I appear* (in Lat. *videor*), *I think*, fut. δόξω, 1 aor. ἔδοξα, perf. pass. δέδογμαι (Lat. *visus sum*), aor. pass. ἐδόχθην.
3. ξυρέω, *I shear*, *cut the hair*, mid. ξύρομαι, aor. ἐξυράμην, but perf. ἐξύρημαι.
4. ὠθέω, *I push*, imperf. ἐώθουν, fut. ὤσω and ὠθήσω, 1 aor. ἔωσα and ὦσα, perf. ἔωκα, mid. fut. ὤσομαι, aor. ἐωσάμην, perf. ἔωσμαι, aor. pass. ἐώσθην.

VII. *Verbs which in the Present and Imperfect have the Pure Stem, but in the other Tenses have a Stem with ε as the Characteristic. (The ε passes into η; except ἄχθομαι and μάχομαι.)*

1. ἀλέξω, *I ward off*, fut. ἀλεξήσω (the active is unusual in prose), mid. *I ward off from myself*, *I defend myself*, *I punish*, fut. ἀλεξήσομαι, aor. ἠλεξάμην (from ΑΛΕΚ-).
2. ἄχθομαι, *I am vexed*, fut. ἀχθέσομαι, aor. ἠχθέσθην, fut. pass. ἀχθεσθήσομαι, of the same import as ἀχθέσομαι.
3. βόσκω, *I feed*, *pasture* (intrans.), fut. βοσκήσω, 1 aor. ἐβόσκησα; mid. with pass. aor. (ἐβοσκήθην), *I feed*.
4. βούλομαι, *I am willing*, fut. βουλήσομαι, perf. βεβούλημαι, aor. ἐβουλήθην and ἠβουλήθην.
5. δέω, *I lack*, *want* (commonly as the impers. δεῖ, *there is want*, *there is a necessity*), subj. δέῃ, part. δέον, inf. δεῖν; imperf. ἔδει, opt. δέοι, fut. δεήσει, 1 aor. ἐδέησε, perf. δεδέηκε; mid. δέομαι, *I need*, fut. δεήσομαι, aor. ἐδεήθην, perf. δεδέημαι.
6. ἐθέλω and θέλω, *I am willing*, *wish*, imperf. ἤθελον and ἐθελον, fut. ἐθελήσω and θελήσω, 1 aor. ἠθέλησα and ἐθέλησα, perf. only, ἠθέληκα.
7. εἴλω, *I press*, *I drive*, *enclose*, fut. εἰλήσω, perf. mid. or pass. εἴλημαι, aor. pass. εἰλήθην.
8. ἜΡΟΜΑΙ, *I ask*, aor. ἠρόμην, *I asked*, subj. ἔρωμαι, opt. ἐροίμην, imper. ἐροῦ, ἐρέσθαι, ἐρόμενος, fut. ἐρήσομαι; the other tenses are supplied by ἐρωτᾶν.
9. ἔρρω, *I go forth*, fut. ἐρρήσω, 1 aor. ἤρρησα, perf. ἤρρηκα.
10. εὕδω (commonly καθεύδω), *I sleep*, fut. καθευδήσω, 1 aor. ἐκαθεύδησα, perf. wanting.
11. ἔχω, *I have*, *hold*, imperf. εἶχον, 2 aor. ἔσχον, inf. σχεῖν, imper. σχές, πάρασχες (-μι), subj. σχῶ, -ῇς, παράσχω, παράσχῃς, etc.; opt. σχοίην (-μι), but in composition παράσχοιμι; part. σχών; fut. ἕξω and σχήσω, perf. ἔσχηκα, aor. mid. ἐσχόμην; subj. σχῶμαι, opt. σχοίμην, imper. σχοῦ, παρασχοῦ, inf. σχέσθαι, παρασχέσθαι, part. σχόμενος, fut. ἕξομαι and σχήσομαι, perf. mid. or pass. ἔσχημαι, aor. pass. ἐσχέθην.
12. ἕψω, *I cook*, fut. ἑψομαι, aor. ἥψησα, aor. pass. ἡψήθην, perf. mid. or pass. ἥψημαι.
13. καθίζω, *I seat*, *I set*, *I seat myself*, imperf. ἐκάθιζον, old Attic κάθῖζον, fut. καθιῶ, 1 aor. ἐκάθῖσα, old Attic καθῖσα, perf. κεκάθῖκα; mid. *I seat myself*, *I sit*, fut. καθιζήσομαι, aor. ἐκαθισάμην, *I seated myself*, *I sat down;* but καθέζομαι, *I seat myself*, *I sit*, imperf. ἐκαθεζόμην, fut. καθεδοῦμαι.
14. μάχομαι, *I fight*, *contend*, fut. μαχοῦμαι (instead of μαχέσομαι), aor. ἐμαχεσάμην, perf. μεμάχημαι.

15. μέλλω, *I think to, I am about to, I loiter;* imperf. ἔμελλον and ἤμελλον, fut. μελλήσω, 1 aor. ἐμέλλησα.
16. μέλει μοι τινός (Lat. *curae mihi est aliquid*). *I care for* (the first person, μέλω, is rare), fut. μελήσει, 1 aor. ἐμέλησε, perf. μεμέληκε, 2 perf. μέμηλε; mid. μέλομαι (commonly ἐπιμέλομαι, and very often also ἐπιμελοῦμαι, *I care for*), fut. ἐπιμελήσομαι, aor. ἐπεμελήθην, perf. ἐπιμεμέλημαι.
17. μύζω, *I suck*, fut. μυζήσω, etc.
18. ὕζω, *I smell*, fut. ὀζήσω, 1 aor. ὤζησα, perf. ὕδωδα (in Homer and the later writers) with a present signification.
19. οἴομαι and οἶμαι, *I think*, 2 pers. οἴει, imperf. ᾠόμην and ᾤμην, fut. οἰήσομαι, aor. ᾠήθην, οἰηθῆναι, perf. wanting.
20. οἴχομαι, *I am out* (Lat. *abii*), imperf. ᾠχόμην, *I came forth*, fut. οἰχήσομαι, *I shall go forth*, aor. wanting; perf. ᾤχημαι, *I have come forth* (commonly only in combination, as παρῴχημαι).
21. ὀφείλω, *I am liable, I owe, I must* (Lat. *debeo*), fut. ὀφειλήσω, 1 aor. ὠφείλησα, perf. ὠφείληκα; 2 aor. ὤφελον, -ες, -ε (1 and 2 plur. not in use) with the infinitive in expressions of a wish (Lat. *utinam*).
22. πέτομαι, *I fly*, fut. πτήσομαι, aor. ἐπτόμην, πτέσθαι (not so often ἐπτάμην, -μι), perf. πεπότημαι.
23. χαίρω, *I rejoice*, fut. χαιρήσω, aor. ἐχᾶρην (-μι), perf. κεχάρηκα.

With these verbs may be classed several liquid verbs, which, however, form the future and the aorist regularly: for example, μένω, *I remain*, perf. μεμένηκα, otherwise regular; νέμω, *I divide*, fut. νεμῶ, 1 aor. ἔνειμα, perf. νενέμηκα, mid. νέμομαι, fut. νεμοῦμαι, aor. ἐνειμάμην, perf. mid. or pass. νενέμημαι, aor. pass. ἐνεμήθην.

EXERCISE 121.

Translate into English:—

1. Οἱ στρατιῶται τοὺς πολεμίους ἀλεξήσονται. 2. Μὴ ἀχθέσθητε ὑπὲρ ὧν ἡμαρτάνετε ἐλεγχόμενοι. 3. Ὁ ποιμὴν αἰγῶν τὴν ἀγελὴν ἐν τοῖς ὕρεσι βοσκήσει. 4. Οἱ στρατιῶται ἐπὶ τοὺς πολεμίους στρατεύεσθαι ἐβουλήθησαν. 5. Τοῖς στρατιώταις ἐν τῇ πολεμίᾳ γῇ τῶν ἐπιτηδείων δεήσει. 6. Πλούσιός ἐστιν οὐχ' ὁ πολλὰ κεκτημένος, ἀλλ' ὁ μικρῶν δεησόμενος. 7. Πολυδεύκης οὐδὲ θεὸς ἠθέλησε μόνος, ἀλλὰ μᾶλλον ἡμίθεος σὺν τῷ ἀδέλφῳ γενέσθαι. 8. Οἱ βάρβαροι ὑπὸ τῶν Ἑλλήνων διωχθέντες, εἰς τὸν πόταμον εἰλήθησαν.

EXERCISE 122.

Translate into Greek:—

1. The booty was divided. 2. I will divide the booty. 3. The city will punish the enemy. 4. My son, do not be vexed when reproved for thy sins. 5. Good boys are not vexed when reproved for their sins. 6. I will make an expedition against Athens. 7. They smell of perfume. 8. The soul will fly up to heaven. 9. Good men rejoice at good. 10. Our soldiers have need of provisions (necessaries). 11. A good man will care for his children, and good children will care for their parents.

KEY TO EXERCISES.

Ex. 105.—1. Do not dig up the grave of one who has been buried. 2. Tumults of the mind mislead even a wise man. 3. Themistocles the Athenian was disinherited by his father on account of the faults of his youth. 4. God has arranged everything for the best in nature. 5. As you have wealth, stretch out your hand to those that are poor. 6. If we have wealth we shall have friends. 7. If you love yourself over-much, you will not have a friend. 8. The enemy were pursued. 9. Things unexpected are often being done, have been, and will be done. 10. If you think about wars and business, your life will be disturbed.

Ex. 106.—1. Οἱ βάρβαροι ὑπὸ τῶν Ἑλλήνων ἐδιώχθησαν. 2. Οἱ βάρβαροι εἰς τὴν πόλιν ἔφυγον. 3. Οἱ πολέμιοι τὴν πόλιν κατεφλεξαν. 4. Σὺ πολέμου φροντίζεις. 5. Ὑμεῖς πραγμάτων φροντίζετε. 6. Πολέμου καὶ πραγμάτων φροντίζων ταράττει. 7. Πολλὰ καλὰ ἔργα ὑπὸ τῶν Ἑλλήνων ἐπράχθη. 8. Αἱ γυναῖκες καταπλαγεῖσαι ὑπὸ τῶν πολεμίων ἔκραγον.

Ex. 107.—1. Free me, my friend, from my toils, scatter my cares, and turn me again to gladness. 2. Mithridates has plundered Asia. 3. Think before acting. 4. The gods bestowed happiness on men. 5. God has fitted all things together. 6. If you judge wrongly, God will hereafter judge you. 7. In Draco's laws one punishment had been laid down for all transgressors—death. 8. Speak not eulogies on thyself. 9. The youths among the Greeks were accustomed to bear hunger and thirst and cold, and in addition blows and other hardships.

Ex. 108.—1. Μέριμναι σκεδάζονται. 2. Μέριμναι σκεδασθήσονται. 3. Ὄλβος ὑπὸ τῶν θεῶν βροτοῖς ὀπάζεται. 4. Δράκων μίαν ζημίαν, θάνατον, ἁπάσαις ἁμαρτίαις ὥρισεν. 5. Τοὺς Ἀθηναίους ἀεὶ θαυμάσομεν. 6. Οἱ Ἀθηναῖοι ἀεὶ τεθαυμασμένοι εἰσίν. 7. Οἱ Ἕλληνες τοὺς ἐφήβους πάντας πόνους φέρειν εἴθιζον. 8. Σωκράτης τῆς σοφίας ἐθαυμάσθη. 9. Ἡ ᾠδὴ πάσας ἡμετέρας μερίμνας ἐσκέδασεν.

Ex. 109.—1. It is not easy to judge friends. 2. Wealth has often misled him who has acquired it into a different habit of life. 3. The messenger brought news of the victory. 4. The enemy ravaged the country. 5. Pity shipwrecked men, since a voyage is uncertain. 6. If you kill your foe you will pollute your hands. 7. I shall sow the fields, but God will give the increase. 8. Do not reveal the secrets of a friend. 9. It is not easy to change an evil nature. 10. Chance often trips up the proud unexpectedly.

Ex. 110.—1. Οἱ παῖδες τὰς χεῖρας μιαίνουσιν. 2. Οὐ δύνατόν ἐστι φίλους κρῖναι. 3. Πολλοὶ ὑπὸ τῆς ἀδολεσχίας διεφθαρμένοι εισίν. 4. Ἡ νίκη ὑπὸ τῶν ἀγγέλων ἐπηγγέλθη. 5. Οἱ ἀγαθοὶ τοὺς πένητας οἰκτεροῦσιν. 6. Ἐκ τῆς σῆς ἐμπειρίας πολλὰ ἐκέρδανας. 7. Φίλοι φίλων τὰ κρυπτὰ οὐκ ἐκφανοῦσιν. 8. Οἱ πολῖται τὰς γυίας σπείρουσιν.

Ex. 111.—1. The soldiers were encouraged for the fight by the general. 2. Philip lost his sight by a wound in the eye from an arrow at the siege of Methone. 3. The fruit of wisdom shall never be destroyed. 4. I should be ashamed if I appeared to think more of my own glory than the common safety. 5. Milo, the athlete of Croton, took up a bull, and carried it through the midst of the race-course. 6. News had been spread through the city that the enemy were conquered. 7. The citizens will be avenged on the enemy for the defeat.

Ex. 112.—1. Ὁ στρατηγὸς τοὺς στρατιώτας εἰς τὴν μάχην παρώξυνεν. 2. Οἱ στρατηγοὶ τοὺς στρατιώτας παροξυνοῦσιν. 3. Οἱ πολῖται τοὺς πολεμίους περὶ τῆς ἥττης ἀμύνονται. 4. Εἰ σπουδάζεις πάντα τάχα περανεῖς. 5. Πάντα ὑπ' αὐτοῦ πεπέρανται ὅτι ἐσπούδαζεν. 6. Οἱ πολέμιοι οἱ διεσπαρμένοι πάλιν φανοῦνται. 7. Ἀγαθὸς πολίτης μᾶλλον φροντίζει τὸν κοινοῦ ἢ τοῦ ἑαυτοῦ ἀγαθοῦ. 8. Ὑπὸ τῆς νικης πάντες οἱ πολῖται εὐφράνθησαν. 9. Ἡ πόλις ὑπὸ τοῦ πολεμίου διέφθαρται.

THE ORGANS OF SENSE.—IX.

[*Continued from p.* 113.]

V.—THE ORGAN OF TOUCH.

THE sense and organ of touch have been placed last in the list, because we have been all along proceeding from the more special to the more general sensations. The retina of the eye is specially modified and set apart to receive and interpret the light. Light has neither meaning nor effect when applied to other parts of the body; and the retina is out of the reach of other kinds of contact, and is quite insensible even to great heat, as Professor Tyndall has shown experimentally. The ear appreciates the aërial waves which are otherwise unknown. The nose and mouth, though they are less exclusively devoted to smell and taste, and not so specially modified to receive these impressions as are the foregoing organs, yet have special sensations. The sense of touch is more akin to what may be called common sensation, or general consciousness, and the organ is more widely extended and more intimately connected with other functions than the organs of the other sensations. If the eyes were closed, and no objects presented to the senses of hearing, taste, or smell; and if, further, the body could be floated in a liquid of such temperature and consistence as to present to the mind no sensation of contact, there would still doubtless be a general consciousness of the existence of the body, not only as an intellectual deduction but as a sensation. This sensation forms an indissoluble link between mind and body. When all goes well there is a feeling of pleasurable existence, which may be called general and massive, rather than special or intense. When any part is disordered, a general feeling of depression cannot be shaken off. The sense of touch is allied to this general consciousness, but it differs from it in that its impressions are distinctly referred to the parts from which they proceed—the mind is able to localise them with precision. With regard to the locality of the impressions which proceed from the viscera, we know but little except by reason. Hence ignorant people will refer maladies very wrongly. Thus we hear of heartburn and stitch in the side. Nervous people will attribute rheumatic muscular pain to the lungs, stomach complaints to the heart, and lumbago to the kidneys. This wrong reference is made even when the pain or inconvenience is occasioned by a mechanical cause, as by distension or pressure; but directly the cause of these obnoxious sensations reaches the skin, we can at once fix on the locality. Thus we learn that the sense of touch is distributed over the surface of the skin, and to those extensions of it which proceed from it to line the interior of the passages leading from the exterior of the body. The organ and sense of touch does not go far as we proceed into the interior of the body by these passages. Thus the throat is only sensitive to touch at its top part. The sensation of heat and cold proceeds further down towards the stomach, and below this all localised tactile sensation ceases.

In describing the organ of touch we must therefore explain the nature of the integument and its appendages, although in so doing we are aware that this integument has many other functions, and is intimately blended with other structures which have nothing to do with the sense, but which we are compelled to notice.

The skin consists of two layers. The outer one is called the cuticle or scarf-skin (epidermis), and the deeper layer the cutis vera or dermis. The cuticle has neither blood-vessels nor nerves, but consists of cells which are formed at its inner surface (where it lies on the cutis or true skin), and are pushed outward as fresh strata are successively formed below them. When first formed, these cells are filled with fluid; they are oval, and longer in the direction perpendicular to the surface than in the other. As they are thrust outward, they become flattened in the contrary direction, so that at the surface they form dry transparent layers, which are shredded off and stripped away in scaly or scurfy fragments by the ordinary wear and tear to which the outer surface is subjected.

The office of this part of the skin is simply protective; and in relation to this office of clothing and defending the blood-bearing skin, it is found thickest where there is the greatest friction, and thinnest where there is least. It is, however, thin everywhere, varying from $\frac{1}{12}$ of an inch in the palm of the hand to $\frac{1}{200}$ of an inch in less exposed parts. As, however, this scarf-skin is in continual process of being rubbed away, it is not only thicker in much-used parts, but is much more rapidly formed on those parts. Moreover, if any peculiar employments make the wear and tear excessive, unwearied nature still supplies the demand, and an excessive manufacture of fresh cells is stimulated from below. Thus, in the polishing of japanned articles it is found that no other fabric but the human cuticle is sufficiently delicate to produce the shining surface. The finest wash-leather would scratch; and hence women are employed to scour trays, etc., all day long; and yet they never wear down to the true skin so as to make the fingers sore, except during the first few weeks. The provision for the repair of this closely fitting vestment is even carried beyond this, for if the whole cuticle be stripped off, so as to leave the cutis naked and sore, there is an immediate outpouring of fluid from the blood, which soon forms a scarf-skin.

As this scarf-skin has no blood-vessels running into its substance, it has no means of self-repair; so that in proceeding from the deeper layers to the surface, the cells go through all the processes of birth, death, decay, and dissolution, though the membrane is so thin. Since, also, this skin has no nerves entering it, it has no sensation, and the sensation of touch must be felt *through* it in the same way—though in a much more perfect manner—as we feel anything which touches us through our clothing. It will be seen, then, that it must fit very accurately and closely to the sensitive skin beneath, or the sense would be dull and imperfect. The skin below has an immense number of small hillocks, and each one of these is closely surrounded by, and enclosed in, the inner layer of the cuticle which is moulded upon them. When the cuticle is stripped off after being long soaked in water, it shows an infinite number of small pits, out of which the hillocks or papillæ have been dragged. If the whole be torn away before maceration, *i.e.*, from the living skin, it usually tears away the papillæ with it, leaving a bleeding surface.

In providing at once for the protection of the cutis, and also for the preservation of the acuteness of the sensation of touch, there is this difficulty: those parts which are most used to gain information by touch are necessarily those which are most subject to friction. In such situations, then, the cuticle must be thick; yet a solid thick sheet would be liable to make us confound impressions made by two points near together which were in contact with the skin. There is a beautiful arrangement to obviate this difficulty, which is found in the cuticle of the tips of the fingers, palm of the hand, etc. Here the surface of the skin is seen to be thrown into small ridges and furrows, which run in curved lines parallel to one another, so that an impression made on the surface, or tops of the ridges, is only conveyed down to the papillæ immediately beneath it, and does not press sideways on those of the other ridges. A more minute examination of the tip of the finger with a lens will show that these wavy ridges are subdivided into square-shaped masses by cross furrows, which occur at regular intervals, so as to leave the thickened part between of the same width as the ridge. Each one of the square-shaped masses has in its centre a little pit, which is the opening of a sweat-gland. No such definite arrangement of ridge and furrow occurs in other parts of the body, where the sense of touch is comparatively obtuse, or rather, not nicely distinguishing.

The cutis, or blood vascular skin, is tough and elastic, and consists in its deeper layers of interlaced fibres which hold in their interspaces little masses of fat, sweat-glands, oil-glands, and hair-bulbs, with hairs proceeding from these last which rise above the surface. It is also permeated with nerves, arteries, and veins. This, therefore, is a structure having all the endowments of life, and with the faculty of self-sustenance and sensitiveness. The true seat of the sense of touch is, however, its external portion, that which lies immediately under the cuticle. Towards the surface the fibres become closer and denser, and the various glands and fatty masses cease, while the blood-vessels and nerves are more numerous. In order to increase the touching surface, and to bring the nerve-threads closer to the exterior, the outer surface of the true skin is, as we have seen, raised at intervals into papillæ. Each of these is well supplied with vessels and nerves. Under the ridged surface of the palmar side of the hand, these papillæ run in lines corresponding to the ridges, there being two rows to each ridge, and sometimes smaller ones between. In other parts they are scattered irregularly, and are much fewer in number. That these papillæ are the true seats of the sense of touch appears not only from the fact that nerves are traced into them, but because there is a strict relation between their number in a given space and the delicacy of the sense of touch in those parts. Thus in the space of one square line ($\frac{1}{144}$ of a square inch) there are 108 on the tip of the finger, 40 on the second joint, and only 15 on the last; and this decrease in number is in direct proportion to the sensitiveness of the surface to touch. Where the sense of touch is most acute and discriminating, little oval-shaped bodies have been found, one lying in the centre of each papilla, and these have been called the "little bodies of touch." It must not be supposed, however, that each of these papillæ is capable of transmitting a separate impression to the brain, or that their office is simply tactile. Nerves do not enter all of them, and they are concerned in secreting the substance to form the cuticle. It would seem as though each nerve which conveys a single distinct impression to the mind had a certain definite space of surface of skin, over which its final branches spread themselves; so that if two objects touch the skin at two different points within this area, they feel like one. In order to be felt as two separate contacts, they must be placed one on one special nerve-area, and one on another. The size of the special spaces allotted to each nerve-unit is very different in different parts of the body. The determination of the size of these areas, and, by consequence, the accuracy of the sense of touch in various parts of the body, was effected by Weber. His method was at once so ingenious and so simple that it is curious it should not have been adopted before. He took a pair of compasses, and having placed upon their points very small globules of sealing-wax, opened them to a small distance, and applied them to the surface of the body where the sense of touch was to be tested. The impression produced was as of a single point. He then opened them more and more until two distinct impressions were felt; and then measured the distance on a scale of inches and lines. He thus arrived at very definite and very interesting results. Among many other measurements of the least distances at which two points could be distinctly felt, we quote the following:—

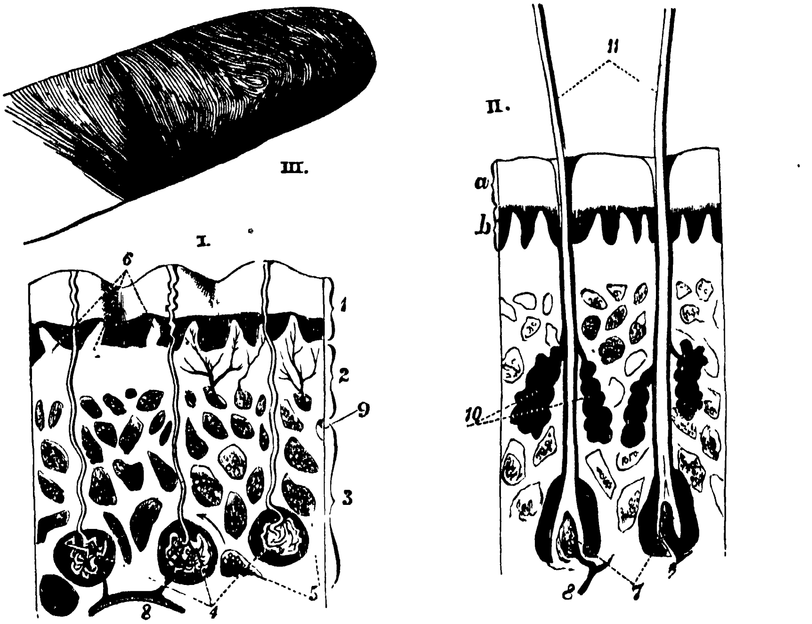

Fig. 18.—I. Section of the Hairless Skin (much magnified). II. Section of the Hairy Skin (much magnified). III. Tip of the Forefinger.

Refs. to Nos. in Figs. I., II.—1, epidermis or scarf skin: (*a*), superficial layers; (*b*), rete mucosum. 2, cutis or vascular skin. 3, subcutaneous layer, composed of fibres, enclosing—4, sweat glands; and 5, fat cells. 6, papillæ. 7, hair bulbs and their papillæ. 8, 9, nutrient arteries. 10, oil glands. 11, hairs.

	in.	lines.
Tip of the tongue - - - - - -	0	0½
Tip of the forefinger - - - - -	0	1
Second joint of forefinger - - -	0	2
Back of the fingers - - - - -	0	8
Palms of the hands - - - - -	0	5
End of the great toe - - - - -	0	5
Back of the hand - - - - - -	1	2
Scalp of the head - - - - - -	1	3
Breast - - - - - - - -	1	8
Middle of thigh, arm, and back - -	2	6

The reader may verify these estimates for himself, but it is better to try them on some other person, because the impressions produced upon the eye and the mind by the sight and knowledge of the open compasses have a tendency to bias the information received from the sense alone. The legs of the compasses must be applied both at the same instant, and not moved before the estimate is given. If they are moved, very different results will be given. From these statistics it will be seen that the tip of the tongue is the most discriminating part of the whole body. An easy verification of this will occur to everyone when they remember how small a flaw in the teeth the tongue can detect—a flaw which is quite unnoticed by the tip of the finger, if that be applied to it. At first thought, it may seem strange that such acuteness of touch should be bestowed on an organ which is rarely used to gain tactile information, and so placed as to be difficult of application to external objects; but when we consider how needful it is that the tongue should be able to feel every particle of food, so that we may know whether it is hard or soft, large or small, and be able to place it accurately between the teeth if it be not soft enough or too small, we cease to think the arrangement strange. The tongue, too, works in the dark with very little assistance from other senses, and so must be always on the alert.

Next to the tongue come the tips of the fingers and thumb. These are the salient points of that wonderful piece of mechanism, the hand. The hand of man is pre-eminently *the* tactile organ, and the free sweep of the arm, which enables it to turn in every direction, and to be applied to every part of the person, is an admirable accessory to its acute sense of touch. The lips are but little inferior to the fingers in acuteness of touch. A story is told of a blind girl, whose employment caused a thickening of the cuticle of her fingers to such an extent as to create a difficulty in reading her New Testament in raised letters for the blind. She at first tried the unfortunate expedient of paring the skin of her fingers, which made them more acute for a short period, but in the end, of course, duller, so that she could no longer read the loved volume. With a sentiment of grief and despair she stooped to give the sacred text a farewell kiss, and so discovered a new mode of studying it. Though, doubtless, this has become quite a platform story, it has in it so much physiological truth that there need be no hesitation in repeating it. Referring again to the probable theory that there is a separate area to each nerve-unit, it will be seen that that area occupies a space of six or seven square inches on the middle of the back or thigh, and only one square line on the tip of the finger. The former measurement is approximately 1,000 times as large as the latter. It is curious how nicely the discriminating sense of touch is adjusted to those parts where it is most likely to be of service. Thus, since the angles of the body are more likely to come in contact with other bodies than its depressions or the middle parts of its segments, we find the skin over the junction of two long bones more able to discriminate than that over their middle portions. The convexities of the joints are usually more discriminating than the concavities; the shoulder more than the arm-pit, and the elbow than the inside of its joint. Yet when we arrive at the hand the reverse is the case, for the palmar surface is more discriminating than the back part. This is for the obvious reason that we usually avoid knocking our knuckles against anything, while to grasp is so natural to the hand that it is quite an instinctive action, as every infant manifests.

SPANISH.—XI.

[*Continued from p.* 118.]

NUMERALS (*continued*).

THE cardinal numbers for *eleven hundred*, *twelve hundred*, *two thousand*, *three thousand*, etc., are *mil y ciento*, *mil y docientos*, *dos mil*, *tres mil;* for *a hundred thousand*, *two hundred thousand*, etc., *cien mil*, *docientos mil;* for *a million*, *two millions*, etc., *un millon*, *dos millones*. *Millon* is not an adjective, but a noun.

Uno is declinable, changing the final *o* into *a* whenever it refers to a feminine noun. All of the cardinal numbers ending in *-ientos* form their feminine in *-as;* as, docientas mugeres, *two hundred women*. The rest are indeclinable.

All the ordinal numbers change the last *o* into *a* to form their feminine.

Uno drops the last letter when it comes before a noun.

Ciento drops its last syllable when it comes immediately before a noun, but not when any other word comes between it and the noun: thus, cien soldados, *a hundred soldiers;* and ciento y tres soldados, *a hundred and three soldiers*.

Primero and *tercero*, among the ordinals, drop the final *o* before a noun.

The cardinal numbers (and not the ordinal) are generally used in Spanish to express order or rank, when the number exceeds nine; when under nine, the ordinals are employed; thus:—

Enrique Octavo, *Henry Eighth (the Eighth).*
Cárlos Doce, *Charles Twelve (the Twelfth).*
Tomo diez y ocho, *volume eighteen (the eighteenth).*
Página septima, *page seventh (the seventh).*

In mentioning the days of the month, the Spanish use the cardinal adjectives and not the ordinal, as in English, except in the first day, in which *primero* and not *un* is used; thus:—

El primero de Enero, *the first of January.*
El dos de Febrero, *the two (second) of February.*
El tres de Marzo, *the three (third) of March.*
El diez y seis de Mayo, *the sixteen (sixteenth) of May.*

In dates where figures are used, the article is omitted, and except the first day of the month, the cardinal numbers are used; as—

Madrid, 1° de Júnio de 1845,	*Madrid, June 1st*, 1845.
Paris, 4 de Júlio de 1846,	*Paris, July 4th*, 1846.
Lóndres, 27 de Agosto de 1847,	*London, August 27th*, 1847.

The hour of the day is expressed by the ordinal numbers preceded by the definite article, which must in such a case agree with horas, *hours*, understood (unless the hour be one, when it agrees with the singular, *hora*); thus:—

¿Que hora es? *what o'clock is it?*
Es la una, *it is one o'clock.*
Son las dos, *it is two o'clock.*
Son las diez, *it is ten.*
Son las tres ménos diez minutos, *it is ten minutes before three.*
Son las ocho y veinte minutos, *it is twenty minutes after eight.*

In speaking of the age of persons or things, the verb *tener* is employed in Spanish; as—

El Señor Tournay no tiene cincuenta años, *Mr. Tournay is not fifty years of age.*
Cárlos tiene doce años, *Charles is twelve years old.*

In Spanish it is not said, in expressing measurement, "twenty feet high," or "ten feet long," but "twenty feet of height," "ten feet of length"; as—

La casa tenía sesenta codos de largo, y veinte codos de ancho, y treinta codos de altura,	*The house was (had) sixty cubits long, and twenty cubits wide, and thirty cubits in height.*

THE PRONOUNS.

PERSONAL PRONOUNS.

The personal pronouns of the nominative case, when used, may come either before or after the verb, except the latter be in the imperative mood, or the sentence be interrogative, in which case the nominative generally follows the verb, as viva ella, *may she live*; ¿ha hablado él? *has he spoken?*

As the verb-ending generally indicates of itself the person and number that its nominative must be, the nominative personal pronouns are seldom expressed in Spanish, unless when necessary to distinguish the persons or genders, or to be emphatic, or when a relative pronoun is to follow; as—

Él que tiene dinero, tiene cuidados, *he who has money has cares.*
Él y ella son prudentes, *he and she are prudent.*
Nosotros seramos castigados, y no vosotros, *we shall be punished, and not you.*

The pronoun se, *oneself*, is sometimes used with a reflective or reciprocal verb, and then it is to be rendered in English by *himself*, *herself*, *itself*, *themselves*, or *one another*, as the sense may require, as in the following example:—

Ellas se aman,	*They love themselves* (or, *they love one another*).

The first objective case of all the personal pronouns is also employed with reflective or reciprocal verbs; as—

Nosotros nos aman, *we love ourselves* (or *each other*).
Yo me alabo, *I praise myself.*
Yo no quero alabarme, *I wish not to praise myself.*

The pronoun *se* is also frequently used with the verb in the active voice, of the third person singular or plural, to express the passive voice, as in this example:—

La casa se quemó,	*The house was burned (the house burnt itself).*

The first objective case of all the personal pronouns is sometimes used with a reflective verb in a passive sense; as—

Yo me admiro, *I am surprised (I surprise myself).*
Vosotros os alegrais, *you are rejoiced (you rejoice yourselves).*

Strictly speaking, *se* cannot be used in the nominative case, and should therefore always be considered as governed by a verb. Thus, in such sentences as *se dice*, *se cree*, *se piensa*, the literal rendering is, *it says itself*, *it believes itself*, *it thinks itself*, or *it is said*, *it is believed*, *it is thought*. Still, in translating, it is often more convenient to imagine *se* as an indefinite pronoun of the nominative case, used in the sense of *they*, as se dice, *they say*, that is, *people say*; se piensa, *they think*.

Se and other pronouns of the first objective case are often used in Spanish with neuter and active intransitive verbs reflectively, and in such cases seem redundant in English; as—

De allí se pasó á la ciudad, *thence he passed (himself) to the city.*
Yo me arrepiento, *I repent (myself).*
Se arrepiente, *he repents (himself).*

Se is sometimes used in the sense of *to him*, *to her*, *to them*, *to you* (i.e., *to your worship*). This use of *se* takes place only when another personal pronoun of the objective case and of the third person immediately follows it; as—

Tengo una cuchara; se la daré,[*]	*I have a spoon; I will give it to him.*

When, in cases coming under the above rule, the pronoun *se* does not denote with clearness the number or gender of the noun for which is employed, the second objective is also used; as—

Se lo daré á ella, á ellos, á V., *I will give it to her, to them, to you.*
Se la mandó dar á ellos, *he commanded it to be given to them.*

The first objective case of the Spanish personal pronouns is very often to be rendered in English by the preposition *to* and the pronoun; as, *to me*, *to you*, *to him*, *to her*, *to them*, etc., and it is then equivalent to the second objective, *á mí*, *á vosotros*, *á él*, *á ella*, *á ellos*, etc.; and in some cases some other preposition than *to* is used in rendering the first objective into English; as—

---

[*] We cannot say, *le la daré*, I will give it to him, but *se la daré*.

Juan me dijo, *John said to me.*
Te lo pido, *I ask it of thee* (or, *from thee*).
Se lo agradezco, *I thank him for it.*
Nos lo suplica, *he beseeches us for it.*

The second objective with the preposition *á* is not used, except when the same verb governs two or more pronouns in the objective case, or when it is designed to be distinct or particularly emphatic; as—

Juan viva, dijeron ellos á ella, *John lives, said they to her.*
Yo ví á vosotros y á ellos, *I saw you and them.*
Juan dió dinero á él, á ella, y á tí, *John gave money to him, to her, and to thee.*

To add more clearness or strength to a sentence, both objective cases of pronouns are often employed; the second objective case then being placed either before the first objective or else after the verb, except the first objective case comes after the verb (as in the case of infinitives, gerunds, and imperatives), when the second objective must come after the first; as—

Á mí me dijeron, *or* me dijeron á mí, *they told me.*
Decirme á mí, *to tell me.*
Diciendole á ella, *telling her.*
Díme á mí, *tell me.*

When the sentence may contain a noun in the objective case governed by the preposition *á*, a pronoun of the second objective case is often used in Spanish, and is not to be translated in English; as—

Á Dios nádie le vió jamas, *God no man saw (him) ever; i.e., no one ever saw God.*

Mismo, meaning *same* or *self*, is often used with the nominative personal pronouns: thus, yo mismo, *I myself;* nosotros mismos, *we ourselves*, etc.; and also with the second objective; and must always agree in gender and number with the noun to which the pronoun refers; as—

¿Qué dice de tí mismo? *what sayest thou of thyself?*
La muger hablará por se misma, *the woman will speak for herself.*

Mismo is often used with nouns also; as, la misma María, *Mary herself;* los mismos soldados, *the very soldiers* or *the soldiers themselves.*

When by the pronoun *it* is meant anything to which we cannot apply a gender, *ello* is used. Its first objective *lo* is employed by the same rule. Thus, if it be said, "he has been told to love his enemies, and he does *it*," the pronoun *it* refers to the clause of the sentence, "to love his enemies," and of course has no gender. In such a case, *lo* (not *le* nor *la*) would be used.

Lo is used in Spanish for *so* in English, when the latter can be replaced by *it;* as—

V. piensa que ella es rica, pero no lo es, *you think that she is rich, but she is not so.*
Si lo es, *if it be so.*
Diego lo hace, *James does so.*

Lo is often used for *le* when the latter refers to a masculine noun, and is immediately governed by a verb (though this use of *lo* is not grammatically correct); as—

Espero que lo véo en perfecta salud, *I hope that I see him in perfect health.*

DEMONSTRATIVE PRONOUNS.

The demonstrative pronouns *este* and *aquel* are often used without any noun, and in such a case they have the sense of *this one* and *that one*, or *the one;* as—

Este es aquel de quien yo dije, *This one is the one of whom I said;* or, *this is he of whom I said.*

Todo aquel que is used in the sense of *everyone who;* as—

Todo aquel que bebe de esta ágna, *Everyone who drinks of this water.*

Quien often means *he who, she who, one who;* and *quienes* is used for *they who;* as—

Quien calla otorga, *he who is silent, consents.*
María fué quien lo dijo, *Mary was she who said it.*
Porque los enseñaba, como quien tiene autoridad, *for he taught them as one who has authority.*

Such expressions as *it is I, it is thou, it is he, it is she, it is we*, etc., are rendered in Spanish by *I am, thou art, he is, she is, we are*, etc.; as—

Yo soy, *it is I.*
Ella es, *it is she.*
Ellos son, *it is they.*
¿Es V.? *is it you?*

THE VERB.

AGREEMENT OF THE VERB WITH ITS SUBJECT.

The verb agrees in number and in person with its subject or nominative, expressed or understood; as—

Soy general, *I am a general.*
Ella ama la verdad, *she loves the truth.*
Los Americanos aman las riquezas, *the Americans love riches.*

When a verb has two or more subjects, each in the singular, it is put in the plural; as—

Mi padre y mi madre me aman, *my father and my mother love me.*
Pedro ó Diego vendran,* *Peter or James will come.*

When a verb has two or more subjects of different persons, it is put in the plural, and agrees with the first person in preference to the other two; as—

Mi hermano y yo estamos malos, *my brother and I* (i.e., *we*) *are ill.*
Tú y yo estamos buenos, *thou and I* (i.e., *we*) *are well.*

If the second person should be used with the third, without any first person, the verb must be in the second person plural:—

Tú y ella estais buenas, *Thou and she* (i.e., *you*) *are well.*

When a relative pronoun is the subject of the verb, the latter must agree in person and number with the noun or pronoun to which the relative relates; as—

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* This is different, as will be perceived, from the rule in English syntax, which requires two singular nouns connected by a disjunctive conjunction to have the verb agree with them in the singular form.

Yo soy que hablo contigo, *it is I who speak with thee.*
Vosotros que sois sábios, *ye who are wise.*

A collective noun taken in a general sense, that is, a noun representing the whole of the persons or things mentioned, requires the verb to be of the singular number; as—

El ejército de los Caldéos persiguió al rey, *The army of the Chaldeans pursued the king.*

A subject which is a collective noun, taken in a partitive sense, that is, representing a part of the whole of the collective noun, and conveying plurality of idea, requires the verb to be in the plural; as—

Parte creían lo que les decía, y parte no lo creían, *Part believed what he told them, and part believed it not.*

This last rule is not always followed, even by the best Spanish authors.

In cases in which a verb appears to have two subjects, it must agree with that noun to which it seems more particularly to belong; as—

Los gages del pecado son muerte, *The wages of sin are (is) death.*

USE OF THE MOODS AND TENSES OF VERBS.

THE INFINITIVE, GERUND, AND PARTICIPLE.

The present tense of the infinitive expresses affirmation in an indefinite manner, without reference to number or person, as decir, *to say;* dar, *to give.*

The infinitive is used in Spanish when in English the present participle, preceded by a preposition, is used; as—

En derramar torrentes de sangre, *in spilling (to spill) torrents of blood.*
Vengo de comer, *I come from dining (to dine)*, i.e., *from dinner.*

The infinitive is frequently used as a verbal noun or present participle, by placing the masculine definite article before it; as in these examples:—

Al caer del dia, *at the fall (at the to fall) of the day.*
El leer me gusta, *reading (the to read) pleases me.*
El murmurar de las fuentes, *the murmuring (the to murmur) of the fountains.*

The infinitive is often rendered in English by the present participle, when in Spanish it is governed by another verb; as—

La oimos cantar, *we heard her singing (to sing).*
Le ví correr, *I saw him run*, or *running (to run).*

In Spanish, the gerund is employed in the sense of the present participle in English; as—

Queriendo seguir dispensándolos, plantó árboles frutales, *desiring to continue dispensing them, he planted fruit-bearing trees.*
María está hablando, *Mary is speaking.*
Estando enfermo el presidente, *the president being sick.*
Habiendo conspirado unos caballeros, *some cavaliers having conspired.*

In sentences such as *Charity is increased by cultivating it*, it is allowed in Spanish to use either the gerund without the preposition, or the infinitive mood preceded by the preposition *con;* as—

Nuestros deberes se hacen agradables cumpliéndolos; *or*, Nuestros deberes se hacen agradables con cumplirlos, *Our duties are rendered agreeable by performing them.*

Instead of the gerund of the past, the gerund of the present is sometimes employed, preceded by the preposition *en;* as—

En oyendo esto, salió para Bóston; *or*, Habiendo oido esto, salió para Bóston, *On hearing this, he set out for Boston; having heard this, he set out for Boston.*

The gerund in Spanish is often employed in a manner that requires the adverb *while* to be used in translating it into English; as—

Él que vive en deleites, viviendo está muerto, *He who lives in pleasures, while living is dead.*

The past participle is indeclinable when used to form the compound tenses with the auxiliary verb *haber;* as—

Las mugeres han hablado, *the women have spoken.*
Ella ha hablado, *she has spoken.*

When the past participle is used with any other verb than *haber*, it is declinable; as—

Ella ha sido seducida, *she has been deceived.*
Mis caballos están lastimados, *my horses are injured.*
Mis hijas se hallan molestadas, *my daughters find themselves molested.*
Mis hermanas quedan satisfechas, *my sisters remain satisfied.*
Ellas van satisfechas, *they go satisfied.*
Ella anda pasmada de mis palabras, *she walks enraptured with my words.*
Tiene escritas tres cartas, *he has three letters written.*
Lleva escritas tres cartas, *he carries written three letters.*

The two last examples, it will be perceived, require the participle to agree with the noun governed (*cartas*). *Tener* and *llevar* are, as above, sometimes used as a kind of auxiliary verbs, and can always be rendered by *have;* thus each of these examples may be translated, ***he has written three letters.***

The past participle is in Spanish used with a noun or pronoun in the case absolute: thus, ***hallado*** means *found*, and absolutely, ***being found; enviado*** means ***sent***, and absolutely, ***being sent; recibido*** means *received* and *being received.* In general, the participle is placed before the noun of the case absolute, with which it agrees (though the rules of Spanish construction admit of its being placed after the noun); as—

Tomada Vera-Cruz, el General Scott salió para Jalapa, *Vera Cruz being taken, General Scott set out for Jalapa.*

TENSES OF THE INDICATIVE MOOD.

The present tense expresses an existing state or an action occurring at the time in which we are speaking; as—

Mi hermano escribe, *my brother writes.*
Estas doncellas son amadas, *these maidens are beloved.*

The verb ***estar*** can be used with the gerund in

Spanish, as in English the verb *to be* with the present participle; as—

Juan está leyendo, *John is reading.*
Ellos están cantando, *they are singing.*

The verbs *ir* (to go) and *venir* (to come) do not admit of the verb *estar* coming before their gerund as in the above rule. Thus, we cannot say in Spanish, *yo estoy yendo* and *yo estoy viniendo*, but *yo voy* and *yo vengo* (I go and I come), I am going and I am coming.

The imperfect tense is used to express what is past, and at the same time present with regard to something else which is past: that is, it is a past tense which was still present at the time spoken of. It may always be employed in Spanish when in English the word *was* can be used with the present participle, or *used to* can be employed with the verb, or when we speak of habitual actions; as—

Cervántes era un escritor elegante, *Cervantes was an elegant writer.*
Neron era un tirano, *Nero was a tyrant.*
Cuando fuí niño, hablaba como niño, *when I was a child, I spoke as a child.*
Ella escribía entónces, *she was writing then.*
Seneca razonaba bien, *Seneca reasoned well.*
Ellos marchaban por las calles cuando los vimos, *they were marching through the streets when we saw them.*

It is evident that *Seneca reasoned well* means *Seneca used to reason* (or *was accustomed to reason*) *well.*

The perfect definite tense shows the action or being affirmed by the verb to be completed at a time of which nothing more remains, often specified by an adverb or some other circumstance expressed or understood; as—

El presidente no le perdonó, *the president pardoned him not.*
Diego vivía cuando le ví, *James was living when I saw him.*
Escribió una carta ayer, *he wrote a letter yesterday.*
Recibió dos cartas la semana pasada, *he received two letters last week.*
Luego que Juan se lo dijo, lloraron, *as soon as John told it to them, they wept.*

As both the imperfect and perfect definite in Spanish are included in English in what is called the imperfect tense, it is important that the learner should be able to distinguish the use of each in Spanish. When an action or event is entirely past and finished, the perfect definite is used; but when it is meant to say that the action or event was taking place at a certain time, and that it is or may still be continued, the imperfect must be used. Thus, "los soldados marchaban por la ciudad" means *the soldiers were marching through the city*, and so far as the word *marchaban* is concerned, they may be marching still; but "los soldados marcharon por la ciudad" means *the soldiers marched through the city*, and from the tense employed are marching no longer.

The perfect indefinite is used to express an action or event which, though entirely past, has taken place during a period of time (expressed or understood) of which the present forms a part, or at a time designated in an indeterminate manner; as—

He hablado á Rodrigo esta semana,	*I have spoken to Roderick this week.*

The past actions of persons or things still in existence, if no particular time be mentioned, are expressed in this tense; as—

El general ha tomado varias ciudades,	*The general has taken several cities.*

The only cases in which the English perfect tense and the Spanish perfect indefinite do not correspond are such as the following:—"It has been snowing these three hours"; "he has been in Mexico for these ten years"; which in Spanish would be, "hace tres horas que nieva"; "hace diez años que estoy en Méjico"; which mean literally, *it is three hours that* (*since*) *it snows; it is ten years that* (*since*) *I am in Mexico.* If the sentence be negative, the perfect indefinite is employed, as hace ocho dias que no la hemos visto, *it is eight days that we have not seen her*, that is, *we have not seen her for eight days.* If the action or event be completed, the perfect definite must be used, as hace diez años que el rey le perdonó, *it is ten years that* (*since*) *the king pardoned him.*

Hay (or *ha*) is sometimes used instead of *hace* in cases like the examples in the last paragraph, as hay pocos dias que entré en el cuarto de mi amigo, *it has a few days that* (*since*) *I entered into the room of my friend*, that is, *a few days ago I entered my friend's room.* *Hay* is used at the beginning and *ha* at the end of a phrase, as *hay pocos dias*, or *pocos dias ha.*

The first pluperfect is used to express an affirmation of what is past and took place before some other past action or event or time, expressed or understood; as—

Juan ya había comido cuando llegó Ricardo,	*John already had dined when Richard arrived.*

Whenever the former action or event is mentioned as still continuing when the latter occurred, the imperfect tense is employed in Spanish to denote the former; as—

Había tres horas que ella estaba pintando cuando llego Pedro,	*It was three hours that she was painting when Peter arrived.*

This last example means in English, *she had been painting three hours when Peter arrived.*

The second pluperfect is used to express a past action or event that took place immediately before another action or event also past. It is never used except after some of the adverbs of time: cuando, *when;* así que, *as soon as;* no bien, *no sooner, but* *just ;* apénas, *scarcely ;* luego que, *immediately after;* despues que, *soon after ;* as—

Apénas hubo salido cuando se cayó la casa, *Scarcely had he gone out when the house fell.*

The first future tense affirms what is yet to be or to take place at a future time (mentioned or not) ; as—

Seré presidente, *I shall be president.*
Lucía vendrá mañana, *Lucy will come to-morrow.*

The second future tense affirms something future that will have taken place before or at the time of some other future action or event, or determinate time ; as—

Habré escrito esta carta ántes que Juan llegue, *I shall have written this letter before John may arrive.*
Habrá acabado á las tres, *he will have finished at three o'clock.*

THE TENSES OF THE IMPERATIVE MOOD.

The imperative is that mood which commands, exhorts, or entreats ; as in these examples :—

Hacédlo, *do it.*
Veamoslos, *let us see them.*

The imperative mood is not used in the first person singular ; nor is it used in Spanish for forbidding—that is, it is not employed with a negative adverb, but the persons of the present subjunctive are used when a negative command or a prohibition is expressed ; as—

No temas, *fear not* (i.e., *mayest thou not fear*).
No temais, *fear not* (i.e., *may ye not fear*).

The *s* of the first person plural and the *d* of the second are suppressed before *nos* and *os ;* as—

Congratulémonos, *let us congratulate ourselves.*
Congratuláos, *congratulate yourselves.*

The *s* of the first person plural of the tenses of the indicative mood is suppressed when the reflective pronoun comes after it ; as in this example :—

Amamonos, *We love ourselves.*

When the imperative is negative in English, as the subjunctive is employed in Spanish, the pronouns of the first objective case are not joined to it, but come before it ; as—

No lo hagas, *do (thou) it not.*
No lo haga ella, *let her not do it.*

Que is sometimes used before the persons of the imperative mood ; as—

Que uno de nosotros vaya, *Let one of us go (that one of us may go).*

The persons of the imperative, except the second persons singular and plural, are to be rendered into English by *may* or *let,* as bendiganos el Señor, *may the Lord bless us ;* vaya Juan, *let John go.* But *V.,* with its objective cases, although of the third person, is to be rendered as the second person, as venga V. conmigo, *come with me* (let your worship come with me) ; alabese V., *praise yourself* (let your worship praise himself).*

THE TENSES OF THE SUBJUNCTIVE MOOD.

The tenses of the subjunctive mood differ in signification from those of the indicative only in expressing what they affirm in a *conditional* or *doubtful* manner, while the tenses of the indicative express certainty. Whenever, therefore, there is no doubt about what we affirm, we must use the tenses of the indicative.

The present tense of the subjunctive affirms some doubtful action or event that may take place, and is generally preceded by some conjunction or conjunctive phrase ; as—

Hacéd esto para que vean vuestras buenas obras, *Do this in order that they may see your good works.*

As futurity is implied in the present tense of the subjunctive, the first future of the subjunctive may be used in its place ; thus, we may say, aunque lloremos, *though we may weep ;* or aunque lloraremos, *though we should weep.* The present may therefore be used instead of the future, and the future instead of the present, unless the conjunction *si* (if) be employed, in which case the present subjunctive cannot be used.

The relative pronouns are generally followed by the present or some other tense of the subjunctive, when the sentence is interrogative or negative, or expresses a doubt, wish, or condition ; as—

No conozco una sola muger cuya alma sea mas sensible que la de la Señora Loader, *I know not a single woman whose soul (is) may be more sensible than that of Mrs. Loader.*

Words which in English are compounds of *ever*—such as quienquiera, *whoever ;* cualquiera, *whosoever, whichsoever ;* siempre que, *whenever ;* por mas que, *however ;* por mucho que, *whatever*—in Spanish generally require the present or some of the tenses of the subjunctive ; as—

Por grande que sea tu mérito, *However great that thy merit may be.*

The imperfect tense of the subjunctive affirms an action or event of a doubtful or contingent kind as having to be, or to be done, or as conceived by the mind as having taken place at some time under certain conditions ; as—

Juan leería, si tuviera libro, or Juan leería, si tuviese libros, *John would read if he should have (if he had) books.*

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* In both Spanish and English the future is sometimes used as a command, as no matarás, *thou shalt not kill,* i.e., *do not kill,* or *do not commit murder.*

COMPARATIVE ANATOMY.—XIII.

[Continued from p. 124.]

VERTEBRATA (*continued*).

FISHES (*continued*).

The limits of these lessons will not allow a description of the skull; it can only be said that it may merely consist of cartilage more or less hardened by a deposit of carbonate of lime, or the cartilaginous boxes may be covered by a number of thin bones.

Teeth.—True osseous teeth are found in all the classes of the Vertebrata. The teeth of fishes are generally osseous and plentiful. They present in different fishes a variety of interesting forms. In the perch they are so slender and minute as to resemble the pile of velvet. In the Chætodontidæ,[*] a family of bony fishes, the teeth resemble bristles, whence their name. These fishes are numerous on the rocky shores of warm climates, and are often beautifully and variously coloured. One species of this family, the *Chelmo rostratus*, an inhabitant of the shores of Asia, possesses the faculty of shooting insects with drops of water projected from the mouth, and seizing them as they fall. The well-known pike (*Esox*) has its mouth crowded with innumerable teeth, both sharp and formidable.

The teeth are attached to the bones surrounding the mouth by means of ligamentous tissue, but are not placed in sockets, like those of the higher Vertebrata. They are frequently movable. The teeth of the shark are arranged in several rows, the anterior only being perpendicular; the remainder are recumbent, and wait their time to come into use. (Fig. 37, IV., p. 123.)

When Steno first examined the teeth of the shark, he was surprised to find a great number of teeth placed on the inside of each jaw, lying close to the bone. From their position and arrangement he thought they were useless. Hérissant afterwards showed their use by proving that as the anterior teeth of each row are broken off, drop out, or wear away, the posterior ones come forward to supply their place. This act of renewal seems to be persistent during life. In most fishes the teeth are constantly changing, the older ones being succeeded by others developed in the neighbourhood. Some fishes—for example, the sturgeon—are entirely toothless.

The *alimentary canal* consists of a simple tube, which passes nearly straight through the body. The gullet is short and muscular, and the stomach large, separated from the intestine by a small valve or curtain. Sometimes the stomach, as in the herring (Fig. 37), presents a series of tubular prolongations, which terminate in blind extremities.

The inner membrane of the shark's intestine is arranged in deep spiral folds, which wind from end to end. The compartments between the spiral layers communicate through a small aperture in the centre of each valvular projection. The object of this spiral arrangement is to increase the surface over which the nutrient material of the food has to pass. The valves are kept apart by means of an intervening elastic substance; liver, large; spleen, invariably present; and kidneys likewise.

The *breathing-apparatus* consists of a number of loose fringes or gills suspended in cavities, and attached to bony or cartilaginous arches; three or four, or more, being fixed on each side of the neck. Matteucci estimated the surface of the gills of the common ray to measure 2,250 square inches. The cavity in which the gills are suspended communicates both with the mouth and the outer surface of the body. The water is taken into the mouth, forced through the inner aperture of the gill cavity, where it comes into contact with the gill fringes, bathing them freely, thus aërating the blood which circulates through the minute blood-vessels of the leaflets (Fig. 37). The water is then expelled through the outer aperture, which is guarded by a valvular curtain.

Most fishes possess an air-bladder, which sometimes communicates with the gullet or stomach. It is furnished with a muscular apparatus to regulate its capacity, so as to increase or diminish the specific gravity of the animal. Some anatomists consider it to be homologous to the lungs. Its principal use, however, is, as Willoughby long ago (1686) pointed out, to bring their bodies to an equilibrium with the element in which they swim, to enable them to impel or move themselves in any direction.

The circulatory apparatus consists of a heart with a double cavity and blood-vessels. The upper cavity, the auricle, is thin-walled, and receives the blood from the veins. The lower cavity, the ventricle, is thick and fleshy. By contracting upon the blood it drives it to the gills to be aërated, and thence into the large vessels.

Nervous System.—The brain of fishes is small, and made up of a single and three pairs of little masses of nervous matter. The single one is named the cerebellum. The anterior masses give origin to the nerves of the sense of smell. The organ of smell is the same as that of air-breathing animals, except that it is in contact with water.

The middle pair of masses represents the cerebrum of higher animals. The posterior afford origin to the nerves of sight. The shape of the eye varies considerably in different fishes, but in all the transverse diameter is largest. The size is not in proportion with the body of the fish—for example, the salmon's eye is smaller than the haddock's. The eye is flattened in front, so that in some fishes it is almost half a sphere. The pupil is large, so as to take in as much light as possible, but generally motionless.*

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[*] χαίτη, a bristle; ὀδούς, a tooth.

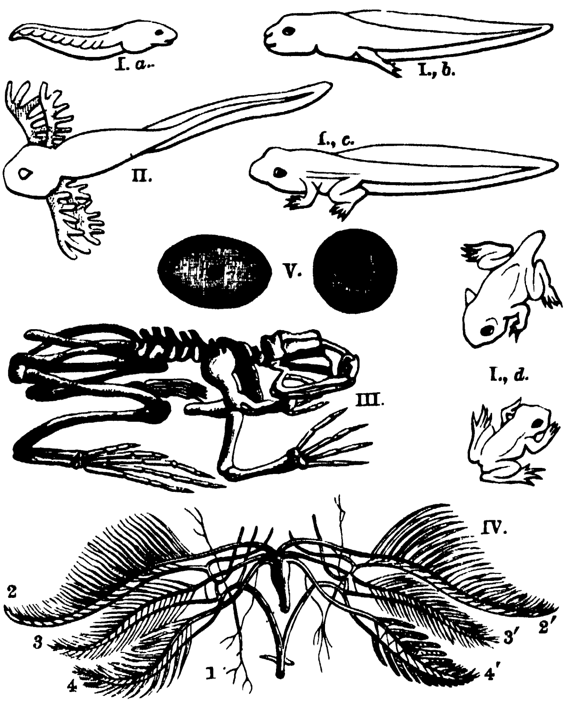

Fig. 38.—Amphibia. I. (*a*, *b*, *c*, *d*) Successive Metamorphoses of the Frog. II. Tadpole of Frog, showing external gills. III. Skeleton of the Frog IV. Blood-vessels of Tadpole of Frog, and their mode of distribution to the gills. V. Blood Corpuscles of the Frog (highly magnified).

Refs to Nos. in Figs.—IV. 1, artery arising from a single ventricle, and dividing into six branches, which go to the three pairs of gills, 2 2′, 3 3′, 4 4′.

The torpedo and electric eel (*Gymnotus electricus*) possess an electrical apparatus, which they can discharge at will, communicating a shock to any animal with which they come in contact. Humboldt relates that he saw two horses killed in five minutes when exposed to the attacks of the electric eel. This eel is a native of the warmer parts of South America, Demerara, Surinam, etc. The sensation produced by the shock from the electric fish is exactly that caused by accumulated electricity as developed by the ordinary machine.

The *roe* or *ovary* may be double or fused into one. When distended it occupies a large portion of the abdominal cavity. The milt, or soft roe of male fishes, has a similar position, and equals in bulk the ovary of the females. They are to the unaided eye so like the female that it is only in the spawning season they can be distinguished. The ovary is nothing more than a membranous bag, with its inner lining folded into broad festoons, wherein the eggs are formed and retained until sufficiently ripe for expulsion.

In the osseous fishes the eggs pass out by means of a small duct which opens just behind the anus, as in the herring. In the cartilaginous fishes, as in the shark and ray, there is a much higher type of generative function. The eggs are extremely numerous, amounting to many thousands. Leuwenhoeck counted no less than 9,384,000 in a middling-sized codfish. Even in the common herring 60,000 eggs have been found in a single female. The parent fish usually selects shallow water for the deposition of her eggs; this done, her maternal duties and anxieties for her offspring terminate.

AMPHIBIA.

In the last lesson we described those animals which occupy the lowest scale of the vertebrate kingdom, live in water, and breathe by means of gills.

Proceeding a step higher in the ladder of vertebrate life, we come to those animals which can live either on land or in water, and are on this account named *Amphibia* (from the two Greek words *ἀμφί, both; βίος, life*), living in two elements. The Amphibia constitute an intermediate form of life between the strictly aquatic and the terrestrial animals. Cuvier classified them under the name of Batrachia in his fourth order of Reptilia; but recent zoologists have justly objected to this classification, and now consider them as a distinct division of the Vertebrata. In order to live in two such different media as water and air, it is requisite that these animals should be in possession of gills like the fish, and also of that form of breathing-apparatus which predominates in the higher forms of vertebrate life, called lungs. The latter consist of membranous bags, divided internally into a number of small compartments or cells, over which the blood is carried by means of a delicate net-like arrangement of capillary vessels, in order that the oxygen element, so essential to the welfare of the component tissues of the animal, may be restored to the blood, and the carbonic acid removed from it. Nothing can exceed the beauty and extreme delicacy of the mechanism of the breathing-apparatus, which, variously modified, is seen to play such a useful part in the economy of the higher animals. The Amphibia possess the typical characters of the Vertebrata, already described. Like fishes they are cold-blooded. Their blood is red and corpusculated. Fig. 38, V., illustrates two red blood corpuscles of the frog, magnified 700 times, after drawings made by Dr. Lionel Beale. The blood corpuscles of the proteus and the siren are the largest known.

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* The eel has a transparent horny convex covering at some distance before the eye to defend it from external accident.

The Amphibia are divided into four orders, as follows :—

(1) The *Urodela*, or those with persistent tails. (2) The *Batrachia*, or frogs. (3) The *Gymnophonia*, or Amphibia with naked snake-like bodies. (4) The extinct *Labyrinthodonta*, so called from the labyrinth-like and complicated arrangement of their teeth.

The first order comprises the newts, salamanders, proteus, siren, etc. The second, toads and frogs. The third, those animals called by Linnæus, Cæcilia (*caecus*, blind). They are, however, not blind, as that naturalist supposed; they have eyes, but very small ones, and nearly hidden under the skin.

The Amphibia undergo a remarkable change, or metamorphosis, as they advance towards maturity. They are, for the most part, developed from eggs deposited in the water and afterwards fecundated. The resulting young are called tadpoles. In their early stage they resemble fishes. They breathe by means of gills, which project from each side of the body behind the head (Fig. 38, II.). They have no fins, and in their early stage they are destitute of legs (Fig. 38, I., *a*). As life advances these external gills disappear, the animal breathing by means of internal gills, which are suspended from arches, and bathed by the water in a similar manner to that arrangement described in fishes. Presently a pair of legs (Fig. 38, I., *b*) may be seen to grow from the sides of the body. The hind legs make their appearance first, and the fore legs subsequently, in the frog (Fig. 38, I., *c*). This is not always the case with the other Amphibia; for example, in the salamander the order of leg-appearance is reversed. In the siren the hind legs are wanting. As the legs approach towards a state of perfect development, the tail gradually contracts and wastes (Fig. 38, I., *d*) until it has completely disappeared. During this period changes are taking place in the internal as well as external economy of the body. Nature now prepares it for an extended sphere of action by endowing it with a pair of lungs, by which it is enabled to live either in its native element or to extend its peregrinations to terrestrial soil, and live there also. This transition from the larval to the frog condition cannot fail to remind the student of another metamorphosis—namely, that which the caterpillar undergoes to become butterfly or moth. In the former the transit is from a strictly aquatic to a double form of life; in the latter from an earthy to an aërial state of existence. It is by such metamorphoses as these that Nature teaches man to aspire to a higher degree of intelligence and usefulness. The lesson comes with an equal force from the much-despised toad—whose hoarse croakings break the stillness of the night in its quiet reign of darkness over its marshy habitations —as it does from the pretty but irresolute butterfly, basking to and fro in the sunshine of day. In the frogs, toads, and newts the gills entirely disappear, and for this reason they have been named Caducibranchiate Amphibia.* Others are called Perennibranchiate Amphibia, from the fact that their gills remain permanently, even after the formation of complete lungs. Such are the proteus and siren; also the axolotl, to which the Mexicans are partial as an article of diet, especially when (as Dr. Baird remarks) dressed after the manner of stewed eels, and served up with rich and stimulating sauces.

The Circulatory Apparatus.—The heart of the Amphibia is indicative of progressive development. It consists of three chambers or cavities. Two of these are reception cavities, and named the systemic and pulmonary auricles; the third is a propelling one, and called the ventricle. The object of the ventricle is to propel the blood to the system and lungs—to the system for the purpose of carrying oxygen for the nutrition of the tissues, and to the lungs so that the oxygen element may be again restored to it from the atmosphere, and to expel from the blood the carbonic acid which results from the waste products.

It will be surmised that in those animals (for example, the frog, etc.) possessing only temporary gills that, as the lungs usurp their place, a change must of necessity arise in the arrangement of the blood-vessels. This is the case. When the lungs come into play, the blood is diverted to them and away from the gills (Fig. 38, IV.). In those Amphibia with persistent gills this change is only partial. In the frog tribe the skin also acts as an organ of respiration by absorbing moisture. By reason of this it is enabled to live for a long time deprived of food and air. This fact has given origin to many preposterous tales of toads being found alive entombed in coal-beds and blocks of stone, where they had evidently existed (believe it who chooses!) for hundreds of years.

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* From *caducus*, easily falling; *branchiae*, gills.

The digestive and nervous apparatus undergo a slight increase in complexity from that described in the last lesson.

Frogs are destitute of ribs, and consequently have not an expansile chest. This compels them to breathe by swallowing the air. The skeleton of the Amphibia evinces decided advances towards that of the higher Vertebrata. This is very evident in the disposition and conformation of the bones of the limbs—*i.e.*, in those which possess the latter. The skull joins with the vertebral column by means of two condyles.

REPTILIA.

Far away beyond the confines of history—probably ages before the secondary organisation—the earth was tenanted by gigantic species of the class Reptilia.

In external appearances and configuration the orders of this class differ materially from each other. The Crocodilia have their bodies covered with horny plates embedded in the skin. Tortoises have a complete external skeleton, covered with thinner plates.. The snakes are destitute of these thick outward investments, but have scales covering their bodies.

The Teeth.—The dental apparatus varies according to the reptile's mode of life. The crocodiles have long jaws, armed with a single row of conical teeth, held in bony sockets. The Chelonia (tortoises, etc.) have no teeth. Their jaws are covered with a horny bill, which serves the purpose of teeth. The teeth of the Ophidia (serpents) are not lodged in sockets. In the cobra, rattlesnake, viper, etc., some of the teeth are grooved or perforated by a canal, which communicates with a poison-gland, and serves to convey the poison into the wound made by the animal's bite. The opening of the canal is not at the extremity of the tooth, but at a point a little above it, so as not to endanger the loss of any of the fluid; man adopts a similar arrangement with his injection-syringe. These teeth are attached to movable bones. When at rest, the poison-fangs are hidden by a fold of the gums. Behind them are rudiments of other fangs to replace the former when they are lost. The poison of some serpents proves rapidly fatal to hot-blooded animals when introduced into the blood current through a wound. When swallowed it is harmless.

The *alimentary canal* presents some differences from that already described in the Amphibia. It is comparatively short, and usually of great width. The gullet is wide and extensible, especially in the snake, which is able to swallow animals of great bulk. The large and small intestines are very distinctly divided, and separated by a curtain or valve. In a tortoise of moderate size the whole length of the alimentary canal was found to be 4 feet. The small intestines were 20½ inches, and the large 16½ inches, long. The stomach was 2 inches long. The intestines terminate in a cloaca, which is also the common point of termination of the urinary and generative organs.

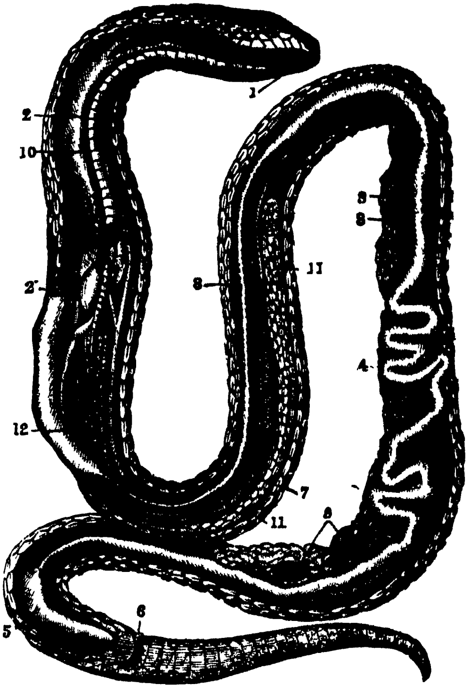

Fig 89.—Reptilia. Anatomy of thf Common Snake (after Milne-Edwards).

Refs. to Nos. in Fig —1, tongue and glottis; 2, gullet, cut across at 2′ to show the heart, etc., *in situ;* 3, stomach; 4, intestine; 5, cloaca; 6, anus; 7, liver; 8, ovarium; 9, ova, or eggs; 10, windpipe; 11, principal lung; 12, little lung.

The Respiratory Apparatus.—The Reptilia never breathe by gills at any period of their existence, like the two preceding classes, but by lungs. These are two in number, and made up of numerous cells, usually of large size, aggregated together. In snakes the lung called the principal lung is much larger than the other, and, in fact, the working lung. The smaller one, called the little lung, is either rudimentary or absent. Tortoises and turtles, like the ribless frogs, owing to their possessing immovable ribs, breathe by swallowing the air. The reptilian heart consists of three cavities. There is an evident tendency in many to the formation of a fourth, by a septal division of the ventricular cavity into two parts; so that the blood, arterial and venous, still mixes. In the crocodiles this intraventricular septum is complete, forming a quadrilocular heart like that of the higher vertebrates.

The blood corpuscles are not very numerous. They are oval in shape and of large size, varying from $\frac{1}{420}$ to $\frac{1}{1400}$ of an inch in the long diameter. and $\frac{1}{750}$ to $\frac{1}{2500}$ of an inch in the short diameter.

The brain is of small size in comparison with the skull.

The young of the Reptilia are developed from eggs. Some are hatched before being born, as in the viper. Some deposit their eggs in the sand on river-banks, and leave them to be hatched by the heat of the sun. The egg of the crocodile is about the size of that of a goose. The turtle makes two or three visitations to the shore in the course of a year to deposit her eggs in a cavity she scoops out to receive them. Her eggs amount to about a hundred at each sitting. She carefully covers them with sand, and leaves them. The mode of development of the reptilian embryo resembles that of the higher Vertebrata. The Reptilia possess a completely ossified skeleton. The skull is small, the greater part of its bulk being made up of jaws. The head is articulated to the spinal column by means of a single condyle. The ribs are numerous in the crocodiles, lizards, and serpents. In the snakes they amount to as many as three hundred pairs.

The vertebra may form a series of ball-and-socket joints, so as to allow considerable latitude of motion. The tortoise is invested by a bony habitation, consisting of two sets of plates, united at the sides, to the inner aspect of which it is immovably fixed. The anterior and posterior extremities are open, to allow the animal to protrude its head and limbs. The upper or back set forms the carapace; the under or ventral, the plastron. The shoulder and pelvic bones, which afford attachment to the limbs, are situated in the interior of this bony house. The neck and tail portions of the spinal column only are free. The bones of the (in Reptilia possessing) extremities are well developed, and approach in character those of the higher Vertebrata. The toes are usually five in number on each foot, movable, and armed with claws.

CLASSIFICATION.—Professor Huxley has grouped the Reptilia into the following orders:—(1) *Crocodilia*, comprising the modern crocodiles, alligators, and caimans, and the extinct Teleosauria and belodonts; (2) *Lacertilia*, lizards, blind-worms, and chameleons; (3) *Ophidia*, or snakes; (4) *Chelonia*, turtles and tortoises. Besides these, there are five orders of fossil Reptilia.

ELEMENTARY POLITICS.—II.

[*Continued from p. 129.*]

NATURE AND OBJECT OF THE STATE.

POLITICAL discussions, as we have said, tend to go back to first principles. Discussions, therefore, on the duty of the State in a given case naturally lead us to ask what is the purpose of the State. Suppose the State had ceased to exist, with what object should we attempt to set it up again? In history this has often been confused with the question, Why and how was the State originally formed?

This confusion is especially noticeable during the seventeenth and eighteenth centuries in England. The unconstitutional exactions of Charles I., his execution by the Puritan party, the equally unconstitutional interference of James II. with the liberties of his subjects, compelled their respective supporters and opponents to find some general principles on which their action could be justified or condemned. Accordingly, two kinds of theory of the origin and object of the State were brought forward, which were really revivals of theories current during the later Middle Ages. We may call them concisely Family (or Patriarchal) theories, and Contract theories.

The Family theories need not detain us long. Their best-known exponent was Sir Robert Filmer, who died in 1647; but his treatise, "Patriarcha," was not published till 1680. His view is substantially as follows:—The Creator granted dominion over the world to Adam, and again to Noah. Noah's sons partitioned the world among themselves, and their sons did likewise. Each son ruled a kingdom consisting primarily of his own descendants. Gradually the households expanded into societies, but each society was still ruled by the eldest surviving male of the eldest branch of it. Kingship is only the extension of the power which each father of a family has in his own household. That power is received from God, and the holder is responsible to God alone for the way in which he exercises it. His duty is to provide for the good of his subjects without regard to their likes and dislikes, just as a father might for very young children. When he dies, his power should descend on his eldest son, or to his nearest male relative, by the rule of primogeniture, which (Filmer held) was appointed by the Scriptures. Thus the king cannot be called to account for what he does, and to resist him is to resist God's appointed deputy.

We need hardly point out that this theory proves too much. Certainly Charles I. could not have shown that he was entitled to the English throne in virtue of primogeniture as heir of Noah. Moreover, the extensive powers claimed by him were not two centuries old. For various reasons—in England because the older nobility, who acted as a check on the royal power, had mostly fallen in the Wars of the Roses—the kings throughout Europe had practically gained great powers; and powers which had really belonged to the Roman Emperors had been attributed by lawyers to all sovereign rulers. Moreover, the attributes ascribed in the Scriptures to the Kings of the Israelites had been ascribed by ecclesiastics to the kings of their own time, the ritual at whose coronation was partly imitated from the Hebrew ceremonial. The English kings of an earlier period had had their powers expressly limited—by the Great Charter, for instance.

But the Contract theories were hardly nearer the truth. It was assumed that men had originally lived together without any regular form of Government; that thus the strong oppressed and slew the weak; and that this state of things was so dreadful that men were compelled to set up some power to keep the peace and to agree to obey it. The nature of the agreement and the powers of the Government were differently conceived by different writers, according to the conclusions they wanted the theory to prove. Thus, Thomas Hobbes, in his "Leviathan" (1651), supposed that the individuals who formed the first society had been so afraid of relapsing into anarchy that they had promised absolute obedience to the Government and given it unlimited powers; and that any sort of interference with the powers of the Government, besides being morally unjustifiable, might bring back the terrible "state of war, every man against every man," that was worse than any oppression by the Government. Hobbes, of course, meant to attack the Commonwealth. John Locke, on the other hand (1689), wished to justify the deposition of James II. He therefore argued that the individuals who entered into the Social Contract only contracted to set up a Government in order to defend their "natural rights"—that is, the claims they had as being men—to life, liberty, and the means of happiness, of which the most important is property. If the Government clearly ceased to do the work for which it was set up, they were quite entitled to depose it. In France, in the next century, Jean-Jacques Rousseau propounded a theory—which he admitted represented what ought to be rather than what had been—which led directly to democratic despotism. It may be stated concisely as follows:—Man is born free, and yet is everywhere in bondage. The only legitimate bondage, however, is that which he makes for himself. To protect themselves, men agree to join into one body and to transfer to it all their rights and powers, and even their property, that it may guarantee to each as much freedom as is consistent with the freedom of the rest. Thus the State obtains the right to do anything to any citizen—to order him to risk his life, or to take away his property, or to put him to death—if by so doing the freedom of the rest were preserved. The absorption of the individual in the State is so complete (according to Rousseau) that, in voting, he is not even expressing his own will. For he has no longer a will. He has surrendered it to the State. But as the State has no single intelligence or mind, each individual citizen must express his opinion as to what it thinks and wills. A vote is the expression of this opinion.

Deductions from Rousseau's theory were the principles of the French Revolution; but they were generally used to destroy the old *régime* or to get rid of political opponents, rather than to guarantee individual liberty or to construct a new society.

Now it is quite certain that no State was ever founded by express contract. It would be a very difficult matter to prove even that new colonies have ever been based on an implied contract. They started as subjects of some other nation, and when they became independent, the old system of government went on with some modifications. Most of the inhabitants probably never thought of contracting to submit, on certain conditions, to their Government. They took it as a matter of course. But a greater objection to all these theories is that they treat the State too much as a collection of individual atoms. But a State is not formed by the combination of individuals who have previously lived in no society. The States we know have grown up out of very small beginnings, in almost all cases largely by conquest and force; and the individual members have acquired the notion of free contract during their association with one another in the State. Primitive people have their life regulated for them—by custom and tradition—even in minute details; the notion that they can regulate their own lives, and the life of the nation to which they belong, is a product of many generations of civil government. The very ideas on which these contract-theories are based—that all men are by nature equal, that a society is a collection of rational beings striving to secure a common good, that men are originally and naturally free and happy, and that they themselves set up a Government to secure their freedom and happiness—are not the ideas of uncivilised man at all. They are the product of centuries of civilisation and government—in particular of the Greek philosophy and the Roman law which these centuries produced.

In fact men have lived in societies ever since they existed at all, not because they agreed to do so, but because they could not have lived separately if they had tried. A society is often compared to a living organism. And there is, in fact, a close resemblance between them. The society lives on while its individual members change, just as the matter of which a living body is composed is in a constant state of change. The society, like the body, contains different parts with special functions. Part of it produces nourishment and means of living for the rest. Part directs and orders the rest, as the brain directs the muscles. The society, like the individual, has a defensive apparatus, and an apparatus for getting rid of injurious matter, in the shape of the criminal courts, the prisons, and the executioner. Moreover, in modern societies, we find much more specialisation of parts—especially in the industrial department—than we do in less civilised societies: just as higher animals are far more specialised than lower.

But we must beware of carrying this analogy too far. A society can never be nearly so specialised in its parts as one of the higher animals is. No man, and no class, is engaged solely in furnishing nourishment, or solely in thinking, as parts of the animal body are. Every member of society has not only his own special activity, but a number of other activities as well. The intelligence of a society is not confined to one class. It is spread through all classes, and particularly so in a modern State. There can never be one "social brain," other parts of the society meanwhile having no share in the general intelligence. And herein lies one justification of popular government or democracy. The intelligence which is diffused through all classes can only be got at by allowing all classes to express their opinion by a vote, and by enabling them to gain as much information and discuss political questions as freely as possible.

But in proportion as this is done more thoroughly, the State will become more and more like the sort of State that Locke and Rousseau sketched out—at least, in its broad general aspects; for many of Rousseau's details are fanciful and impossible. The members will recognise more clearly that they are united to strive to obtain a common good—liberty not simply to do as they like, but to make the best use of their faculties and to enable other people to do so. They will recognise that to obtain this common good, submission to the law is unavoidable, and that even a certain restriction of individual rights and individual liberty to do things not in themselves harmful may be desirable to further its attainment. They will see that the broad general lines on which they are to proceed in attaining it are laid down, either expressly or tacitly, in the Constitution of the State, and that as the good itself cannot be defined in precise terms; there is no means of deciding certainly on any proposed measure except by estimating its probable consequences. And they will understand that—although it is no doubt necessary to leave one's parliamentary representative very great freedom of action, since he has more time and means of knowledge than most of his constituents—yet primarily they are to consider, less what sort of a person he is than what sort of policy he proposes to support.

FUNDAMENTAL NOTIONS CONCERNING THE STATE.

Primarily, then, a State is a body of men living together on some one territory and subject to some one authority, whose business it is to promote their common good—that is, to ensure (so far as it can) that every citizen shall be free to make the best use of his powers, and develop himself to the best of his ability. This authority generally has not been set up at first by the citizens. But as civilisation advances it tends to exist by the tacit consent of the citizens. They may not have formally agreed to set it up, but they frequently make changes in the details of its arrangements, and nobody can doubt that, if a large majority of them chose (for instance, if the authority went beyond the customary limits of its action), it would be physically possible for them to upset it. This authority is called the Sovereign, and every member of the community is its subject.

We must be very careful not to confound the Sovereign, in this sense, with the person at the head of the State, popularly called "the Sovereign," but whom we shall here call "the Crown." The Queen, for instance, is not "Sovereign" in the sense that she alone has power to issue general commands to her subjects, and enforce obedience. No single person in Europe has such a power except the Czar of Russia.

The business of the Sovereign is (1) to issue general commands or laws to its subjects, and enforce obedience to them by penalties, technically called "sanctions," or evils following disobedience. (2) To provide that these laws are carried out. This includes such very diverse kinds of action as providing for the defence of the State from foreign enemies by keeping up an army and navy, providing for the safety of individual members or the whole body by keeping up prisons and police (many of these functions are, of course, delegated to local authorities), providing inspectors to see that such laws as the Education Acts and Factory Acts are carried out, and so on. (3) To judge when these laws have been broken, and to secure that if one member has injured another, the damage shall as far as possible be repaired; and to resent breaches of the criminal law, which are offences against its own dignity, by punishments. The Sovereign does all this by its agents—the officers of the Civil Service and of the Army and Navy, the judges, and other officials. These it either appoints, or, much more commonly, delegates their appointment to agents. Thus the appointment of judges is delegated by the true Sovereign, nominally to the Crown, really to the advisers of the Crown.

To find the Sovereign in a State, then, we must ask—What person or body has (by general consent) power to issue general commands, and enforce their acceptance?

In England this power is possessed by Parliament (that is to say, the House of Commons, which consists of representatives elected by the bulk of the male population—a section, chiefly of the poorest class, being excluded by laws imposing certain qualifications for the franchise—and the House of Lords) and the Crown. The refusal by any one of these to agree to a proposal prevents its passing into law. But in practice, when the House of Commons is determined on a measure, it has been the custom for the Crown for a century and a half, and for the House of Lords for half a century, to give way, provided the measure is very strongly backed by public opinion.

A law proper is a general command issued by the Sovereign, enforced by penalties, and relating to a class of actions to be performed by a number of people.

Under such a law, rights arise; that is, A being ordered by the law to observe a certain kind of conduct towards B, A has a duty to B and B has a right against A. These are legal rights, and lawyers know of no others. But every law contemplates that a certain kind of relations will arise between the persons affected by it, that each shall be freed from interference of the rest in certain ways. Now, suppose we take a wider view, and regard the world as intended to be a Kingdom of God, ruled by the Divine Law, which aims at the good and happiness of mankind; and suppose that it is the duty of earthly Sovereigns to carry out in the way they think best the purpose of the Divine Law, but that the world being wicked, the Divine Law is often departed from. Then the Divine Law will give us certain broad general outlines of the relations which ought to exist between men, and of the claims which each man, because he is God's creature, is entitled to make against other men. These claims will be his "natural rights," the rights that result from his nature as a man.

Now this is the sort of notion which the Contract theorists had. They regarded States as arising to carry out the broad general outlines of the Divine Law—to make men do their duty towards their neighbours, at any rate so far as to avoid doing them harm. (More than this, it was held, the State could not effect. It proceeds by telling its subjects what they are not to do, which is comparatively simple in comparison with the task of telling them what they are to do.) The object of the State, therefore, is to preserve "natural rights."

Now the objection to this theory is that "natural rights" are far too vague to be described. Nobody has ever tried to specify them all. Nor can anyone say when (as a general thing) the right of one person is overridden by the rights of a number of others. If a railway company proposes to take a house, whether the owner chooses or not, is his "right of property" to prevail against the "rights of other people to the pursuit of happiness," which may be immensely increased if the railway is constructed? If a man is just going to kill me is his "right to life" to avail against mine? If a man is sending his own ship to sea, is his "right to do what he likes with his own property" to be so respected that he may overload it to the endangering of other people's rights to life? And so on. Generally, therefore, the supporters of "natural rights" have had to suppose that individuals tacitly resign to the Sovereign-body, of which they form part, all their rights and the power of judging when they are injured, and that their rights are only granted back under the reservation that the public welfare overrides that of the individual. Still, if we are to look at the business of government as moral at all, we must conceive it as carrying out the moral law, whether we regard that law as revealed in the Bible or as written in men's consciences, or as discovered from observation of what conduct best promotes happiness. And if we bring in the moral law, we cannot avoid introducing the conception of moral or natural rights. But we cannot get much further than the bare conception.

In the Constitution of the United States and some of the original State Constitutions, reference is formally made to natural rights in the preamble; but as the State Constitutions have been gradually revised, the mention has been dropped.

In theory, all law arises from the direct command of the Sovereign. In practice, there are two other great sources of law—Custom and the decisions of Courts.

Many usages grow up without any express command of the Sovereign, and then when they are firmly established are recognised as part of the law of the land. The customs of different trades as to the notice to be given before dismissing an employee are familiar instances. The custom differs in different trades, and no one can say who first instituted it; yet the Courts recognise it. Much of English law consists of such custom.

Again, no law can possibly be worded so as clearly to provide for all the cases possible under it. The legislator cannot foresee the circumstances which may arise. So, when a disputed case arises, it comes before the Courts, and the judge interprets the law. In so doing he very often pronounces on a case of which the legislator had no conception, and so adds to the law, or even alters it. There are cases in which the law has been so worded that its interpretation has really defeated the object aimed at by those who passed it. And every decision of a Court serves as a precedent for similar cases afterwards. Thus, fresh law is constantly growing up by custom, and existing law is constantly being extended and amplified by "case-law."

Now the Sovereign might alter any of these additions by statute; when it does not, we must infer it approves of them, and that they are to rank as its commands and be enforced by its officials. It is therefore a maxim, "What the Sovereign permits, it commands."

Constitutions, Written and Unwritten. — The general principles which regulate the form of Government and the way the work of Government is carried on, together make up the Constitution. Most modern States have formulated these principles in some kind of document, and established some special authority whose business it is (amongst other things) to decide alleged cases of the violation of this Constitution. In England this has never been done. Certain agreements between the king and the people—the Great Charter in particular—certain laws of special importance, such as the Acts arranging the duration of Parliaments and the mode of their election, or the Act settling the Royal Succession, and certain usages which Governments habitually observe—for instance, that a Ministry either resigns, or dissolves Parliament if a vote of want of confidence in it is passed—together make up the Constitution. But there is no authoritative statement of the Constitution as a whole, and no Court or other body authorised to say whether it is violated; while Parliament may at any moment alter any part of it. Now, where written Constitutions exist, they are usually enacted, not by the regular legislature, but in some other way, and the regular legislature cannot (at any rate by itself) alter them. Indeed it may be said that in such cases the regular legislature is not the real Sovereign; but a body to which the real Sovereign—the power which makes the Constitution—delegates the legislative power usually. As the power of the English Parliament—unlike that of the American Congress, for instance—is formally unlimited by a Constitution, it is the fashion to talk of the omnipotence of Parliament. Practically, of course, we recognise that some laws are much more important than others, and that some customs of political action would in practice be much harder to disregard than some statutes are; but theoretically English law makes no distinction between one statute and another.

THE SPHERE OF GOVERNMENT.

Should the Government of a State try to promote the welfare of its subjects directly, or should it limit its action to keeping the peace between them—protecting the persons and property of each from injury? And if it should try to promote their general welfare, how far may it safely go? Ought it (for instance) to choose a religion and require them to adopt it? ought it to compel them to be educated in a certain way? ought it to punish them for doing actions which concern themselves almost entirely (for no action concerns a man's self absolutely), such as getting drunk? Or, bearing in mind that very nearly all that a modern Government spends is raised from its subjects by taxation, is it entitled to provide institutions for its subjects which many of those subjects do not care about? Any parish in England may impose a rate on its members (provided the majority of them agree to it) for the purpose of building baths, washhouses, or free libraries. Now many of the ratepayers, especially the richer ones, have no use for these institutions. Is it fair to make them pay part of the expenses?

Now the stricter forms of the Social Contract theory, it is clear, would limit the action of the State in this direction very considerably. The State (the supporters of such a theory would say) is an association formed to protect its citizens. If it does anything more it goes beyond its scope, just as a company formed to make a railway would be exceeding its powers if it took to brewing beer. Its members set up a Government to preserve their liberty of action, and anything that involves interference with this liberty defeats the object of the State.

When the Contract theories were most generally believed in, however, most of the more modern questions as to State interference had not yet been raised. (Occasionally, the theory was used as an argument that the Government ought not to interfere in religious questions.) Besides, the Contract theory must necessarily imply that the State has a right to do anything which will secure the maintenance of the Contract. It may, for instance, compel its members to serve as soldiers or to go through military training; or it may enforce compulsory education and sanitary regulations, with a view of preventing injury to the State as a whole by ignorance or epidemic disease: indeed, directly

we admit that the State must first of all protect, and that a great deal of protection must be of the nature of prevention, we shall find it difficult to draw any line limiting the functions of the State.

States have, however, frequently tried to promote the positive welfare of their subjects Thus, in France early in the last century many processes of manufacture and trade were regulated by law Inspectors saw that the laws were kept, and there were heavy penalties for disobedience The object was that manufacture should be carried on in the best possible way, and that French manufactures should be preferred to those of other nations It resulted from the "patriarchal theory" of Government held by the official classes in France at that time, that it was the duty of Government to provide in every way for the positive welfare of the people. It was assumed that the Government generally was much wiser than the people, so that it was its duty to do anything it could for them that seemed likely to be beneficial.

St Giles's, Cripplegate

ENGLISH LITERATURE.—XV.

[*Continued from p.* 188]

MILTON.

John Milton was born on December 9th, 1608. He was sprung of an old family; but his father, having adopted the tenets of the Puritan party, had become separated from his kinsfolk, and had maintained himself and his family, earning a competent fortune by pursuing the business of a scrivener, a term which in his day denoted one employed in the responsible office of negotiating investments for money. The poet was born in London, but his childhood and early youth were passed for the most part at his father's country-house at Horton, in Buckinghamshire. His father was himself a man of education and taste, and an accomplished musician; a Puritan in religion, and with, no doubt, those political sympathies which distinguished the Puritans as a party from their religious opponents From him we may presume that Milton received his earliest education. He was then at St Paul's School, in London; and thence he passed to Christ's College, Cambridge, in 1625. Of the details of Milton's life at the university we know little with certainty. Although Milton was all his life a student, with him, more than with most men, it would be inaccurate to speak of any one period as distinctively the period of his education; still, he must have made abundant use of the years he passed at Cambridge. For Milton was one of that small number of men of the highest order of genius whose powers have shown themselves at an extremely early age.

Almost from boyhood he was a poet, as well as a scholar; and almost from boyhood he seems to have been fully conscious of his extraordinary powers. After leaving Cambridge, Milton spent some years at his father's house. The cause of his passing this period of seeming inaction is not far to seek. Milton had been originally designed for, and himself contemplated entering upon, holy orders; but he was deterred from carrying out his intention by a repugnance for the intellectual restraints which such a course would have imposed upon him. And we can easily imagine that, to a mind as keenly alive as Milton's to the responsibilities of life, the choice of a new course was not the work of a day. Upon some such ground he himself afterwards explained the seeming loss of these years. They were not years, however, of idleness, but of profound study. In 1638 Milton went abroad, and spent more than a year in the enjoyment of the society, and in cultivating the friendship, of the most eminent men of letters of the Continent, and especially of Italy.

This visit to the Continent forms the close of the first period of Milton's literary history. He was by this time known as a man of extraordinary learning. Of the ancient languages and literature he was a consummate master; nor was he less familiar with the living tongues. In Italy, the most cultured nation of Europe, his poems, both Latin and Italian, excited general surprise and admiration. But it is as an English writer that, in these lessons, we have specially to do with him.

There are few poets whose productions more clearly reflect the life of their author than Milton's. Not that his works, his poetical works at any rate, contain many direct references to himself or his history; such notices are few. But the spirit and character of his works change with the changes in the spirit and circumstances of the man. The period of Milton's life which we have been hitherto describing was one of tranquillity and repose. His toils were those of the student. He had not yet been drawn into the vortex of religious and political controversy. His works of this period are exclusively poetical. They have all the music which belongs to everything he ever wrote: he shows the same learning, and the same mastery over his learning, as in later writings; the same pure and severe morality, and the same spirit of reverence. But in these earlier poems the whole tone is different from that of the later ones. The prevailing spirit is a keen enjoyment of the beautiful. They have a light-heartedness which for Milton never returned. He still had leisure for—

"Such sights as youthful poets dream
On summer eves by haunted stream."

He had not yet learnt the Puritan horror of the stage. Even in his pensive mood he would—

Sometime let gorgeous Tragedy
In sceptred pall come sweeping by,
Presenting Thebes or Pelops' line,
Or the tale of Troy divine."

Unlike the Milton of later days, who was too rigid, too self-contained to join in the public services of any religious body, he could still write—

"But let my due feet never fail
To walk the studious cloisters' pale;
And love the high embowéd roof,
With antique pillars massy proof;
And storied windows richly dight,
Casting a dim religious light.
There let the pealing organ blow,
To the full-voiced quire below,
In service high and anthems clear,
As may with sweetness, through mine ear,
Dissolve me into ecstasies,
And bring all heaven before my eyes"

We can only briefly mention Milton's poems of this his first period. Passing by a few early works, in some of which the influence of Spenser is apparent, we come to the great Ode on the Nativity. This magnificent ode is said to have been written by Milton at the age of twenty-one.

To the same period belongs the exquisite poem of "Lycidas." It was written upon the death of an intimate college friend of Milton, Edward King, who was drowned in the Irish Channel, while upon his voyage from Chester to Dublin. The poem has something of the artificial character and unreality which might be expected in one composed under such circumstances. It is pastoral in form: the young man whose death is lamented is a fellow-shepherd of the writer.

"Together both, ere the high dawn appeared,
Under the opening eyelids of the morn,
We drove a-field."

The poet introduces all that incongruous mixture of imagery, and peoples his stage with that variety of sacred and mythological personages, Christian and heathen, to which we are accustomed in pastoral poetry. The poem has no passion in it, and little that appeals to the emotions, but for beauty of imagery and perfect harmony of numbers there are few which can be placed on the same level.

The "Masque of Comus" was founded upon a trivial incident which occurred in the family of the Earl of Bridgwater, who, as Lord President of the Welsh Marches, had his residence at Ludlow Castle. His daughter, with her two brothers, lost their way in a wood; and this slight circumstance gave rise to the beautiful poem of "Comus." This graceful poem is framed upon the model of the Masques of

Jonson and Fletcher of which we have already spoken. It differs from its predecessors in the peculiar elevation of tone, the moral dignity, which Milton has thrown into it, as into everything else that he ever wrote. This piece was acted at Ludlow Castle by members of the noble family upon whose adventures it was founded. The music was composed by the celebrated musician Lawes, who also acted a part in the piece. The keynote of the poem is the beauty of virtue and purity, its superiority to circumstances, and the divine protection which attends it.

> "Virtue could see to do what Virtue would,
> By her own radiant light, though sun and moon
> Were in the great sea sunk "

Upon this subject Milton lavishes the richest and most varied eloquence, interspersed with songs of a "Doric delicacy" which is marvellous.

The "Masque of Arcades" is somewhat similar in character to "Comus," but it is as inferior to it in merit as it is shorter in length

But of the poems of this the first period of Milton's career the most remarkable, and probably the most universally enjoyable, are the companion pieces, "L'Allegro" and "Il Penseroso," the one a description of the tastes and pursuits of the cheerful man, the other of the pensive man. It would be difficult to find in any language the same amount of poetical beauty compressed into the same space as in these two short poems. Every word conveys a picture, and the rhythm of every line conduces to the impression which is to be produced.

When Milton returned to England after his short sojourn abroad, it was no longer to enjoy the peaceful repose of the scholar and poet. Henceforth we have to do with him for some years as a prose-writer, one of the most eager and most bitter combatants in the controversies which then stirred men so profoundly. His sympathies as a Puritan would naturally have been on the side of the Parliament and against the King, on the side of the Nonconformists and against the bishops But Milton was no mere partisan of any of these causes. He was the champion of liberty—liberty of thought, of speech, of worship, of action. Liberty was the passion of his life. "Liberty's defence, my noble task," was his work in life. He resisted the dogmatism of the "new presbyter" as strongly as that of the "old priest," and resented the intolerance of popular opinion as keenly as that of the State.

We cannot examine Milton's prose writings in any detail; but the student ought to understand something of their general character, and we treat of them now as a class because most of them belong to this period, though several are of a later date. The greater part of them relate to three great subjects of controversy, in which Milton took an active part—the controversy as to Church government; that as to divorce; and that as to the right or wrong of putting the King to death. In the first of these controversies he engaged almost immediately after his return from abroad. Several Presbyterian ministers had published a treatise bearing upon Church government, under the title of Smectymnus, a name formed from the initial letters of their own names; and in the controversy which ensued Milton fought eagerly in their defence and against episcopacy, his chief antagonists being Archbishop Usher and Bishop Bramhall.

Into the divorce controversy Milton was led through the circumstances of his own domestic history. His first wife was Mary Powell: their marriage was unhappy, and at last she left her husband and returned to her father, and only came back to her home when it was plain that Milton thought of acting upon those very liberal views as to the liberty of divorce and re-marriage which he consistently maintained.

In the third main controversy in which Milton engaged he appeared as the champion of the people of England, to defend their conduct in putting Charles I. to death; his chief opponent being the celebrated scholar La Saumaise, or, in the Latinised form, Salmasius.

These controversial labours, however, by no means represent the whole fruits of Milton's labours during this period of his life. For some years after his return to England he supported himself by keeping a school for boys in London. In 1649 he was appointed to the important office of Latin secretary to Cromwell, and in this capacity conducted the diplomatic correspondence of the Commonwealth.

There still remain a few isolated prose works of Milton, not relating to any of the great controversies of the day, which must not pass unnoticed. The most important of these are an unfinished History of England, a Tractate or treatise on Education, and especially the "Areopagitica," a plea for the liberty of unlicensed printing. This last is the greatest of Milton's prose works, and one which every student of English literature ought to study, for it exhibits the characteristics of his style in a peculiar degree.

Nothing can be more complete than the change which the Restoration wrought in the position and prospects of Milton. Up to that time, whatever his personal calamities, and they were heavy, he had lived in keen enjoyment of the triumph of that cause for which he had fought so long and so strenuously. His position was a singularly trying one. He was growing old; he was blind; the work of his life was undone; the republic for which he had struggled was overthrown; the hated monarchy, and the still more hated prelacy, re-established; the lofty though austere morality of the Puritan supremacy giving place to the unbridled licentiousness of the new *régime.* Milton himself narrowly escaped being included in the list of those sacrificed to the royal vengeance. A proclamation for his discovery was even issued; and more than one of his works was burned by order of the House of Commons. But Milton's was not the spirit to sink in despondency. The same lofty purpose and proud self-reliance which he had shown in the earlier days of conflict did not forsake him in this hour of defeat. The few remaining years of his life were passed in close retirement, for the most part in London; and during these years his greatest works were written.

We know, from Milton's own pen, that from a very early age he had entertained the thought of writing a great epic or heroic poem. We know, too, that, probably under the influence of his favourite master, Spenser, he had at one time chosen the story of King Arthur for his theme, though there is no reason to suppose that he ever actually commenced any poem on this subject. "Long choosing, and beginning late," as he himself tells us, it is probable that many other themes may have passed through his mind before he finally determined upon the sublime history which he has embodied in "Paradise Lost." Even when his subject was chosen, the form and character were not at once determined upon. We know that Milton at one time intended to represent the fall of man in the form of a sacred drama; and it is related upon authority which we can scarcely question, that some of the noblest passages in "Paradise Lost," and notably Satan's celebrated "Address to the Sun," at the commencement of the fourth book, were written as part of the intended play. But in all probability the substance and form of the great work must have been selected, and probably portions of it written, before the Restoration, though it was mainly composed after that event. It was probably completed, and there is no reason to doubt, completed much as we now have it, in 1663; and it was published in 1667.

No English poet, no poet, indeed, of any nation, has ever ventured to treat so vast, so awful a theme as that which Milton has handled in his great epic. He has painted the calm serenity of heaven before sin or discord had found entrance; the war in heaven; the rebellion and fall of the disobedient angels; the horrors of the hell to which they fell; the creation; the temptation and the fall of man; the punishment of the guilty pair, and their penitence lightened by the hope and promise of a future redemption. He has touched the most awful mysteries—the loftiest counsels of heaven and the lowest depths of hell—no less than the history of the human race. He has essayed to

> "Assert eternal providence,
> And justify the ways of God to men."

Nor has he sought in vain to rise "to the height of this great argument." For, whatever his faults, Milton has done what no other poet could ever have done; he has, throughout the whole of his long poem, maintained a sublime elevation of thought, of moral tone, and of style worthy of his subject. Some of the means by which this effect is attained we can easily perceive. Milton's genius was essentially not dramatic; that is to say, he had little power of conceiving, portraying, and giving life to individual characters. And this, which for most purposes would have been a defect, was for this poem an immense advantage. Had the awful personages by whom his heaven is peopled—the Eternal Father, the Divine Son, the great archangels, and all the hierarchy of heaven—been presented to us too vividly, with too much dramatic life. they would have been too like ourselves; the infinite would have been lost in the finite, the Divine in the human; heaven would have become earth. But one power which Milton did possess, and that in a very rare degree—as he showed in his early poems, "L'Allegro," in particular—was the power of minute, delicate, and accurate painting of scenes and incidents. This power he carefully abstains from using in "Paradise Lost." In that poem all is vast, shadowy, indefinite; and by this vagueness of outline Milton adds grandeur to his figures, as mountains are grandest when half veiled in cloud.

Nothing can surpass the masterly art which Milton shows in the conduct of his story, especially the skill with which he preserves a complete unity of interest throughout the whole, and, in spite of the inherent difficulties of his subject, maintains that movement and action which are above all things essential in an epic poem; and this is achieved mainly by making Satan and his subordinate spirits the central figures of the poem. After a few lines of introduction, the first book opens with the scene in hell immediately after the expulsion of the rebel angels from their heavenly home, and we see how Satan,

> "With his horrid crew
> Lay vanquished, rolling in the fiery gulf,
> Confounded, though immortal";

where—

> "A dungeon horrible on all sides round
> As one great furnace flamed, yet from those flames
> No light, but rather darkness visible,
> Served only to discover sights of woe,
> Regions of sorrow, doleful shades, where peace
> And rest can never dwell, hope never comes
> That comes to all"

Satan, raising himself from the lake of fire, awakes his prostrate companions, who, at his words, start up with renewed energy and hope The several leaders of the host, all the evil spirits and false gods whose names are known in history or legend, sacred or profane, are brought before us in passages of wonderful power. They set themselves to make the best of their new and dismal abode. The great city and palace of Pandemonium under their hands "rises like an exhalation"; and an assembly is summoned to decide upon their future course. In the second book the infernal council is described, and its proceedings related. At last it is decided, in accordance with the advice of Satan, that the new-created world with its inhabitant man, of which rumours had been rife in heaven before the fall, should be the point at which they should seek revenge upon their Almighty Victor, by counteracting his beneficent designs, and marring his creation. In pursuance of this purpose, Satan himself undertakes the task of searching out this new world, and he starts upon this errand. Reaching the gates of hell, he finds them guarded by two awful shapes, Sin and Death. And here we meet, in the allegorical conception of these two beings, one of the most sublime passages in all Milton's works. Satan having passed hell-gates, and made his way through the vast expanse of chaos, comes at last within view of "the opal towers and battlements" of heaven—

> "And hard by, hanging in a golden chain,
> This pendant world, in bigness as a star
> Of smallest magnitude, close by the moon."

And so the second book closes. It must be observed that by the world, in this and other passages, Milton means, not the earth, but the globe which he supposed to embrace the whole solar and stellar systems, for his astronomy was that of Ptolemy, not of Copernicus. In the third book the scene changes to heaven. God the Father and the Son, in a marvellous dialogue, discourse of the state of man and the enterprise of Satan; the approaching fall of man, and the Divine purposes of mercy to be fulfilled in his ultimate redemption, are disclosed to us. The poet then again returns to Satan, and traces his wanderings till he lands at last on this earth upon the top of Mount Niphates. In the fourth book Satan, wandering over our globe, comes upon the Garden of Eden, and sees our first parents in their state of innocence and bliss. And their angelic guardians, warned of the presence of the evil spirit, discover him in the bower where Adam and Eve lie asleep, and he is for the time driven from Paradise. Of the following four books the scene is, strictly speaking, on this our earth. Raphael, "the affable archangel," sent by God to warn man of his approaching danger, relates to Adam the great events which had preceded the point of time at which the action of the poem commenced in the first book: the revolt of Satan and his fellows; the war in heaven, with its varying fortunes; the intervention and triumph of the Messiah himself, with the rout of his foes, and their fall from the battlements of heaven to the hell prepared to receive them; the creation of the world, and of man as its inhabitant and ruler; and Adam in his turn relates the result of his short experience of life. And the eighth book ends with a solemn warning of the archangel. In the ninth book is told the temptation and fall, first of Eve, and then of Adam. In the tenth book the doom of man is pronounced, but not without an obscure promise of future redemption. Again we

JOHN MILTON. *(From the Miniature by Samuel Cooper.)*

meet with those two awful shapes, Sin and Death, no longer guardians of the closed gates of hell, but hurrying to this earth, there to find the prey won for them by Satan, and leaving in their track a firm and easy road between earth and hell. Satan in the meantime returns to relate triumphantly in hell his success on earth; and he and his associates begin to feel the first-fruits of the curse by finding themselves transformed into serpents. In the eleventh book the repentance of Adam and Eve is accepted in heaven; but the archangel Michael is sent to expel the guilty pair from Paradise. In this and the twelfth book the archangel, leading Adam to the summit of a hill, shows him in vision the history of his posterity, ending in the final redemption of mankind through Christ. The book and the poem end with the actual departure of Adam and Eve from Eden.

In a work of such magnitude it is hardly necessary to say that even Milton has been by no means uniformly successful in all parts of it. The scenes in heaven are the least satisfactory. In pursuing his purpose "to justify the ways of God to man," Milton has sometimes placed in the mouth of the Almighty arguments and explanations which scarcely tend to exalt our idea of the Divine character. And the scenes which present to us our first parents in their state of innocence, though always full of purity and beauty, have certainly something of monotony, if not of dulness, about them. Action there could, of course, from the nature of the case, be none in such scenes, and the unchanging round of life seems tedious to fallen humanity. It is in the other world that Milton's success has been supreme. The true action of this epic is with the fallen spirits; the real interest of the poem centres in the character and achievements of Satan. It is a trite remark that poets whose genius is not of a dramatic character are apt in portraying their heroes to show us themselves under various disguises; and in the majestic portrait of the rebel Satan it is not difficult to trace some of the features of the rebel Milton. For Satan is no devil of the vulgar, no mere spirit of evil, compounded of baseness and malignity. He is an "archangel ruined"; a form and countenance of celestial beauty, though marred by sin and deformed by wounds and flame; a character of which the basis is a lofty courage which no adversity can shake, a "courage never to submit or yield"; a stern determination and fixity of purpose, though these noble qualities are perverted by "pride and worse ambition." He is still capable of a magnanimous devotion, and a tender pity for those whom his example has brought to ruin. Even for his victims, Adam and Eve, when he first sees them, he is not without compunctious visitings. He can still "feel how awful goodness is," and stands silent and abashed in its presence.

When Milton wrote "Paradise Lost" he does not seem to have at all contemplated a companion poem. The idea of "Paradise Regained" was suggested to him by a Quaker friend, Ellwood, to whom he had shown the finished manuscript of the earlier poem; but Milton at once adopted the suggestion, and in four years after the publication of "Paradise Lost," "Paradise Regained" appeared. It is a much shorter poem, consisting of only four books, as against the twelve of "Paradise Lost." It has always enjoyed much less popularity than the earlier poem, not from any poetical inferiority, but from the nature of its subject, which is didactic rather than epic. It is essentially a companion piece. As the climax of the action of "Paradise Lost" was the temptation and the fall of Adam, the subject of "Paradise Regained" is the temptation and victory of Christ:—

> "Recovered Paradise to all mankind,
> By one man's firm obedience fully tried
> Through all temptation, and the tempter foiled
> In all his arts, defeated and repulsed,
> And Eden raised in the waste wilderness."

Another great work of the same period is the drama of "Samson Agonistes." This play is founded upon the classical model of the Greek tragedies. It is not only very noble and elevated in spirit and character, but contains scenes and passages of very pathetic beauty. In one respect this work has an especial and peculiar interest and attraction for every reader. In the character of the great Hebrew champion in the hour of his fall, his servitude, and his blindness, and in the touching lamentations which he utters, it is impossible to doubt that we are reading to some extent the expression of Milton's own sorrow and bitterness of heart under trials not wholly dissimilar to those of his hero.

There still remains a class of Milton's poems, the consideration of which we have postponed until now, for they belong to no one period of the poet's life, but are scattered over very many years. The sonnet is a form of composition which had already been cultivated with much success in England, as well as in Italy, and notably by Shakespeare and Spenser. But the sonnets of Milton differ from those of all his predecessors in the peculiar concentration of thought and elevation of feeling which they express, as well as in the solemn and organ-like music of their language and versification.

Milton died at his home in London in the year 1674, and was buried in St. Giles's, Cripplegate.

SAMUEL BUTLER.

There is one great poet still to be spoken of, with regard to whom it may well be doubted whether he should be classed with those of the period now under review, that of the Civil War and Commonwealth, or with those of the new era which began with the Restoration. Butler's great work was published wholly after the Restoration; indeed, it could hardly have been safely published before. But it is probable that it had been in great part written many years before; and, at any rate, the longer and more active portion of his life was passed during the civil conflict and under the Commonwealth: the principles, the sympathies, and habits of thought which we find reflected in his works were formed under the severe discipline of those stern times, a very different school from that of the Restoration. And in subject his great work distinctly belongs to the age of Puritan supremacy.

Of the personal history of Samuel Butler we know very little. He was born in 1612 in the village of Strensham in Worcestershire, his parents being probably of humble rank and in needy circumstances. He received his early education at the Grammar School at Worcester. In early life he appears to have acted as clerk to a Mr. Jeffreys, a magistrate of the county of Worcester. Subsequently he formed one of the household of the Countess of Kent, in what capacity is not quite clear; and here he engaged the friendship and society of the great Selden, a man not less eminent for the nobility of his character than for his learning and ability. At a later period Butler resided—it would seem as amanuensis—in the house of Sir Samuel Luke, a Cromwellian officer, an ardent republican, and a strong Presbyterian. Sir Samuel Luke undoubtedly furnished some features for our author's portrait of Hudibras; and his life in Luke's service was not, we may presume, a happy one. In truth Butler's life was throughout a hard one. He was a Royalist and a devoted churchman. He hated the Puritans: their austerity repelled him; their frequent coarseness of thought and manners offended his taste; their theological controversies excited his contempt; their religion seemed to him hypocrisy; their arrogance, narrow-mindedness, and pedantry were disgusting to him. Yet it seems to have been his fate to spend most of his life among Puritans, poor, dependent, the servant of the very men whom he hated. It was not till towards the close of his life that he found his revenge. In "Hudibras," at last, he poured out all the pent-up bitterness of years. The Restoration gave victory to the cause which Butler had always espoused, and, three years afterwards, in 1663, he published the first part of "Hudibras." The second part was published in 1664; and the third in 1678. Immediately upon the publication of the first part of the great satire, its success was established; it became the fashion of the day. But Butler himself remained without any solid reward, and he died in London in 1680, it is said in extreme poverty.

With what degree of outward assistance we cannot certainly say, but certainly at some time and by some means Butler succeeded in acquiring an extraordinary mass of learning, especially in the more obscure and less frequented branches of science and literature. His opportunities, too, of observing the faults and eccentricities of the class of men whom he was afterwards to satirise were, as we have pointed out, abundant. The circumstances of his career gave energy and concentration to his satiric powers. These, added to powers of humour rare not only in their unfailing strength but in the variety of their character, qualified him to take his place as the great satirist of the seventeenth century, and one of the greatest satirists of modern Europe.

The satire of "Hudibras" is unquestionably the most remarkable book written on the Royalist and anti-Puritan side of the great conflict of its author's days. Its object is to present the Puritan party in the most ludicrous, the most odious and contemptible light. This is effected by describing the character and adventures of the two heroes of the poem, Sir Hudibras, the representative of the Presbyterian section of the Puritans, and his squire, Ralph, who represents the Independents. It has sometimes been suggested that Butler was largely indebted to "Don Quixote" for the conception of his satire; and no doubt the idea of choosing a knight and his squire as the heroes of the poem was suggested by the great Spanish satire. But beyond this there is nothing in common between the two works. In fact "Pickwick" has much more in common with "Don Quixote" than "Hudibras" has. Quixote is the picture of "a noble mind o'erthrown"; a character really brave and chivalrous, but rendered ludicrous by its illusions; a career essentially noble, but out of place. Hudibras is the portrait of a creature utterly base, mean, false, and cowardly, a hypocrite and a pedant. Every line in the description of him and his squire, every ludicrous adventure through which they are led, is designed to render them not merely ridiculous, but hateful and contemptible. Every comparison which Butler's fertile imagination could devise, every allusion which his vast learning could suggest, is directed to heighten this effect. "Hudibras" is the bitterest, and by far the most learned, as well as one of the most humorous of satires. The peculiar jingling metre in which it is written is admirably suited for the subject.

ARCHITECTURE.—XIII.

[*Continued from p* 146]

THE ENGLISH RENAISSANCE.

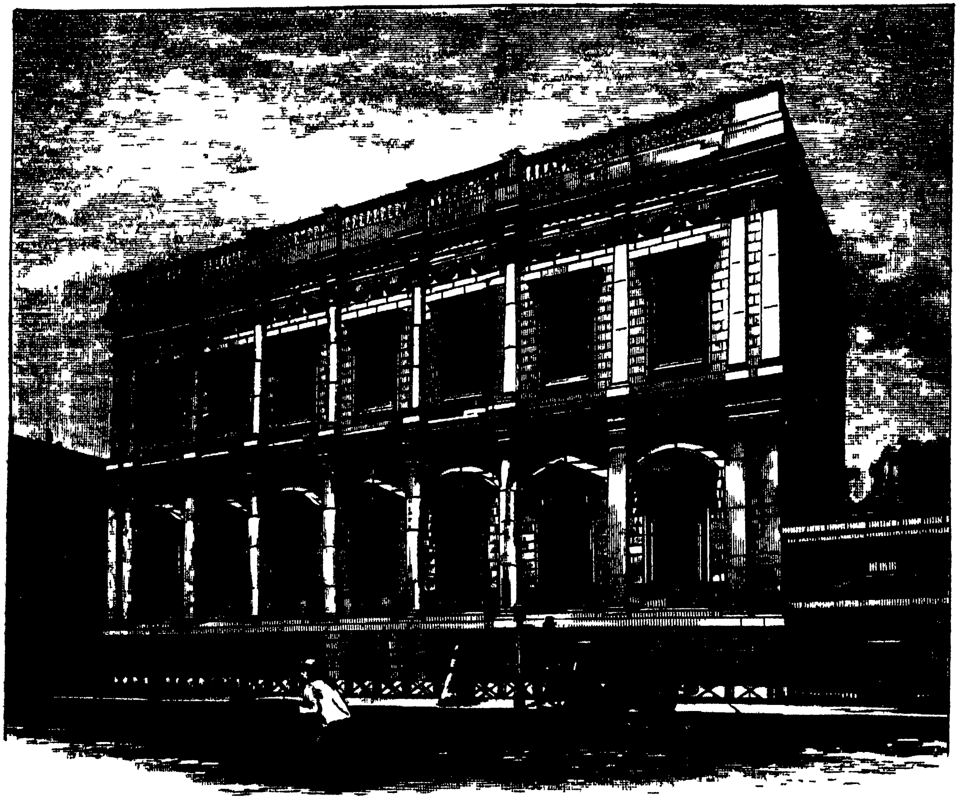

Fig 48 —The Banqueting House, Whitehall (*From a Photograph by Bedford, Lemere & Co.*)

The introduction of the Renaissance style in England follows very much on the same lines as that which we have already described in France. In both countries there existed the traditional influence of the Gothic style of building; and the absence of that wealth of ancient classic remains, such as are found in Rome and various parts of Italy, retarded in both the acceptance of that purer phase of the style which is known as the Italian We have seen how in France already in 1540–48 the Italian style was employed in the Louvre, Paris. In other parts of France, another fifteen years pass before its influence is recognised. In England, we have to wait till 1616–20. When Inigo Jones returned from his second visit to Rome, we find in the Banqueting House at Whitehall (Fig 48)—the only portion of the Palace built—the first results of his Italian training. On the other hand, owing to the bringing over to England of Italian artists by Henry VIII, we find the introduction of classic ornament in tombs and small features as early as 1512; so that there may be said to exist a century of transition in England. The first building in which we find classical ornament is Layer Marney Hall, in Essex, which was completed in 1525. Among the artists brought over were two architects, John of Padua and Theodore Havenius of Cleves. To the latter is due the design of the Gate of Honour, Caius College, Cambridge, and to the former, portions of Longleat; but the exterior was remodelled about 1575–80 for Sir John Thynne, possibly by Robert Smithson, who afterwards designed and carried out, under John Thorpe, Wollaton Hall, Nottinghamshire. In both cases, the details are so pure that it is probable they were taken from the book of the orders published by John Shute in 1563. Knowle House, Kent, and Kirby Hall, Nottinghamshire, are both attributed to John Thorpe, an architect of great eminence, to whom also we owe Holland House, Hatfield (Fig. 50), and Audley End. The terms usually given to the Transitional period in England are Elizabethan and Jacobean. The characteristic features of the style are · the breaking up of the wall surfaces by projecting wings, centre-pieces, and bow windows, and the large windows divided by mullions and transoms—all features derived from the later periods of Tudor Gothic. In many buildings we find a flat roof, which must be an Italian introduction. Not content, however, with the cornice or balustrade, the centre and side wings, and sometimes the window-heads, are crowned with compositions of pierced stone-work, rising ten feet or more above the roof, and which is known as strap-work. Similar work is found crowning the numerous sixteenth and seveteenth century tombs in Westminster Abbey and elsewhere. The lofty roofs which exist in France are not found; in fact, the sixteenth century roof is of less inclination than in the Gothic period. One of the quaintest conceits of the style, and which must be ascribed to mere pedantry, is the grouping of the orders superimposed one above the other to form a frontispiece to a central projecting block. This is found in the Bodleian Library and in other colleges at Oxford.

The first introduction of the Italian style is found, as before observed, in the Banqueting House, Whitehall, by Inigo Jones. In this building the classic orders are employed in the same way as those to which we have already referred in Italy by Vignola and Palladio, and which in England is known as Palladian. Inigo Jones was a great admirer of this work, and in the villa at Chiswick erected for the Duke of Devonshire he adopted portions of a design by Palladio for the Villa del Capra near Vicenza. It would be difficult to find buildings more unsuited to our climate, with spread porticos and small windows, such as in this and later works which we find introduced into England at this period.

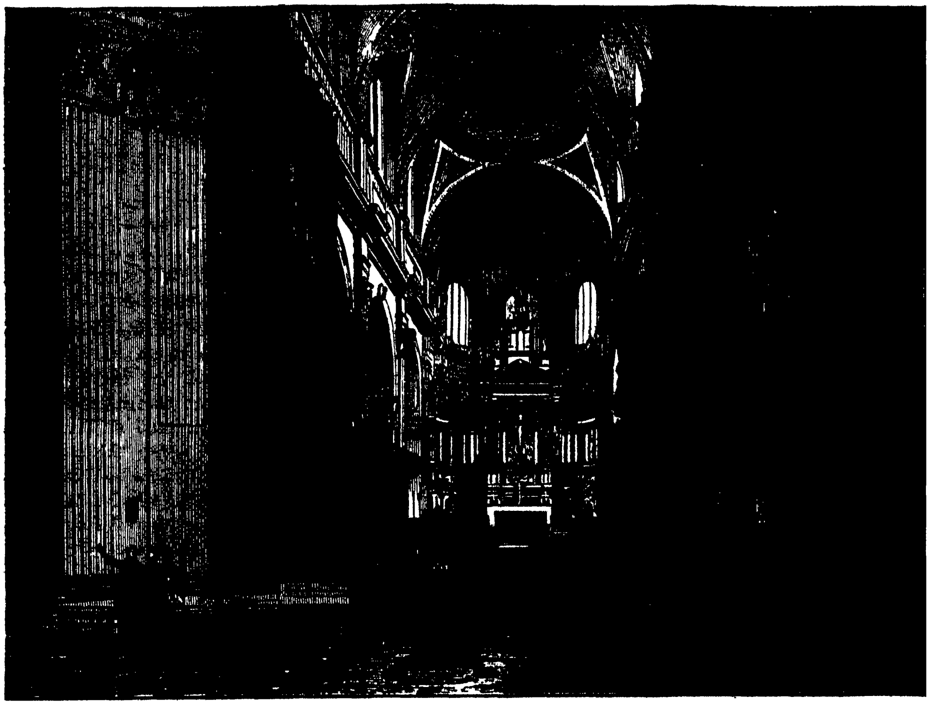

Fig. 49.—St. Paul's Cathedral: the Choir. *(From a Photograph by F G. O. Stuart, Southampton.)*

We have hitherto spoken only of secular buildings for the simple reason that, owing to the suppression of monasteries at the Reformation and the very large supply of churches which had been built by the Roman Catholics, there was no further need of any ecclesiastical buildings; and had it not been for the great fire of London, which burnt the old Early-English cathedral of St. Paul's and so many of the London churches, we might have waited almost to this century before churches of any importance were required.

Sir Christopher Wren was in Paris when the great fire took place, but he hurried back to London and at first turned his attention to a general plan for rearrangement of the streets round St. Paul's, which, if carried out, would have solved for all time one of the greatest difficulties with which the City has now to contend—viz., the narrow thoroughfares in its most crowded parts. In 1773 Wren was instructed to prepare plans for a new cathedral; the first design he produced, and of which a model exists in the South Kensington Museum, in its plan and internal effect would have been far finer than the one carried out. Externally, however, the dome overpowered the rest of the building, which consisted of one storey only, the walls of which were decorated with Corinthian pilasters with entablature, and an attic storey somewhat resembling that of St. Peter's at Rome, on which it was probably based. It was possibly the want of height in this design that led Sir Christopher Wren in the second design to substitute a second storey in the place of the attic storey, and although to a certain extent portions of this are sham walls which mask the buttresses of the nave, choir, and transept, few are probably aware of this fact; so that the deceit, if it may so be called, is never recognised. The second design was completed and accepted in 1775. In comparison with St. Peter's in Rome, the nave and aisles are apparently larger, owing to the increased number of bays—the dome, instead of being carried on four piers as in St. Peters, rests on eight: the internal proportions of the dome are finer than those of St. Peter's, and although there is an internal and external shell, with a difference of fifty feet vertical height between them, still the internal height is too great to be seen properly from the nave (Fig. 49).

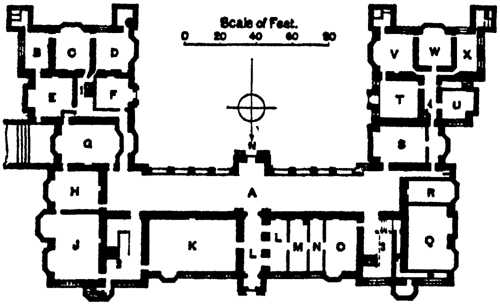

Fig. 50.—PLAN OF HATFIELD HOUSE.

A, Cloisters; B, Dressing Room; C, Lord Salisbury's Bed Room; D, Study; E, Dressing Room; F, Chestnut Room; G, Morning Room; H, Yew Room; J, Summer Drawing Room; K, Marble Hall; L, North Hall, M, Coffee Room; N, Steward's Office; O, Steward's Room; P, Pantry; Q, Kitchen Half Storey; R, Myrtle Room; S, Chapel; T, Lime Dressing Room; U, Chaplin's Room; V, Lime Room; W, Ash Room; X, Ash Dressing Room; 1, Poplar Staircase; 2, Grand Staircase; 3, Adam and Eve Staircase; 4, Elm Staircase.

The exterior design is far more successful, and the grouping of the western cupolas and the central dome are in outline and composition the finest in Europe.

COMMERCIAL CORRESPONDENCE.—X.

[*Continued from p.* 182.]

FRENCH, GERMAN, AND ENGLISH.

56.—FORM OF ENGLISH POLICY OF MARITIME ASSURANCE.

IN THE NAME OF GOD, Amen. Messrs. N.N., as well as in their own name as for and in the name and names of all and every other person or persons to whom the same doth, may, or shall appertain, in part or in all, doth make assurance, and cause themselves and them, and every of them, to be insured, lost or not lost, at and from London to Riga, including all risk in craft to and from the vessel, upon any kind of goods and merchandise, and also upon the body, tackle, apparel, ordnance, munition, artillery, boat, and other furniture, of and in the good ship or vessel called the ***Mary***, whereof is Master under God, for this present voyage, N. N., or whosoever shall go for master in the said ship, or by whatsoever other name or names the same ship, or the master thereof, is or shall be named or called; beginning the adventure upon the said goods and merchandise, from the loading thereof aboard the said ship and craft in the river Thames upon the said ship, etc. (*here follow list of cargo and value of each item*), and so shall continue and endure, during her abode there, upon the said ship, with all her ordnance, tackle, apparel, etc., and goods and merchandise whatsoever; until the said ship shall be arrived at Riga, and upon the said ship, etc, and until she hath moored at anchor twenty-four hours in good safety; and upon the goods and merchandise, until the same be there discharged and safely landed. And it shall be lawful for the said ship, etc., in this voyage, to proceed and sail to, and touch and stay at, any ports or places whatsoever, for all purposes, and with liberty to take in and discharge goods at all ports or places she may touch at, without being deemed any deviation, and without prejudice to this assurance.

The said ship, etc., goods and merchandise, etc., for so much as concerns the assured, by agreement between the assured and assurers in this policy, are and shall be valued at . . . to pay average on each 10 bales of cotton of following numbers or on the whole of each mark and species of goods. Touching the adventures and perils which we the assurers are contented to bear, and do take upon us in this voyage, they are: of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of marque and countermarque, surprisals, takings at sea, arrests, restraints and detainments of all kings, princes, and people, of what nation, condition, or quality soever, barretry of the master and mariners, and of all other perils, losses, and misfortunes that have or shall come to the hurt, detriment, or damage of the said goods and merchandise and ship, etc., or any part thereof. And in case of any loss or misfortune, it shall be lawful to the assured, their factors, servants, and assigns, to sue, labour, and travel for, in and about the defence, safeguard, and recovery of the said goods and merchandise and ship, etc., or any part thereof, without prejudice to this insurance; to the charges whereof we the assurers will contribute, each one according to the rate and quantity of his sum herein assured. And it is agreed by us the insurers, that this writing or policy of assurance shall be of as much force and effect as the surest writing or policy of insurance heretofore made in Lombard Street or in the Royal Exchange, or elsewhere in London. And so we the assurers are contented, and do hereby promise and bind ourselves, each one for his own part, our heirs, executors, and goods, to the assured, their executors, administrators, and assigns, for the true performance of the premises, confessing ourselves paid the consideration due unto us for this assurance, by the assured, at and after the rate of ten shillings per cent.

In witness whereof, we the assurers have subscribed our names and sums assured in London.

N.B.—Corn, fish, salt, fruit, flour, and seed are warranted free from average, unless general, or the ship be stranded. Sugar, tobacco, hemp, flax, hides, and skins are warranted free from average, under five pounds per cent., and all other goods, also the ship and freight, are warranted free of average, under three pounds per cent. unless general, or the ship be stranded.

(*Here follow the names of the underwriters with the amounts.*)

57.—Form of French Police d'Assurance Maritime.

Aujourd'hui le . . . entre nous soussignés, L . négociant demeurant à . . d'une part et . . . (la compagnie générale des assurances maritimes de ce port) . . d'autre part, a été convenue et arrêtée la police d'assurance qui suit:

Le sieur L . . déclare avoir chargé . . . (tonneaux de vin de Bordeaux) . . et qu'il évalue à la somme de . . francs la pièce, ce qui fait au total la somme de . . francs, sur le navire . . en chargement au port de . . capitaine . . . de . . . le dit navire partant du port de . . . pour . . . . où il fera son déchargement, ne devant toucher de relâche volontaire . . . . . (qu'à) . . duquel chargement il justifie par un double de lui certifié, du connaissement à lui delivré le . . par ledit capitaine . . et qu'il a remis à (la compagnie générale, etc. . . .)

La compagnie, etc. . . . . assure au sieur L . . la somme de . . francs, montant dudit chargement, justifié par le duplicata du connaissement, qu'elle (il) reconnait avoir reçu et dont elle (il) se contente, et ce en cas d'accidents, et risques de mer, à raison desquels les lois maritimes obligent l'assureur, à garantir et indemniser l'assuré.

Les risques à charge de . . (la compagnie, etc.) . . . assureur, courront à partir du moment où . . (le pilote lamaneur quittera ledit navire après l'avoir mis en mer) . . et finiront . . . (seulement au moment où le navire sera mouillé dans le port de sa destination).

Les parties ont fixé et déterminé la prime d'assurance à payer par le sieur L . . à la compagnie . . . à la somme de . . . ce qui est à raison de . . pour cent, lequel paiement sera effectué dans les . . (trente) . . jours de la nouvelle de l'arrivé dudit navire à sa destination.

En cas de perte du navire ou de la chose assurée, . . . la compagnie, etc. . . paiera le montant de l'assurance, la prime déduite, au sieur L . . . dans les . (trente) . . jours de la signification de ladite perte. La prime ci-dessus stipulée ne pourra être augmentée ni diminuée, quels que soient les événements de paix ou de guerre qui surviendraient entre la France et les autres puissances pendant la durée dudit voyage.

(Les parties se soumettent respectivement, quant à l'exécution de la présente police, à tout ce qui est prescrit par les lois maritimes et le code de commerce, en matière d'assurance; et en cas de contestation elles déclarent s'en rapporter en dernier ressort à la décision de Messieurs S . . L . . et M . . qu'elles nomment à cet effet leurs arbitres, et amiables compositeurs, leur donnant tous pouvoirs à ce nécessaire, même celui de choisir un autre arbitre en remplacement de celui d'entre eux qui, le cas de contestation arrivant, ne pourrait ou ne voudrait en connaitre.)

Fait-double à . . jour, heure, mois et au susdits

(Signatures)

58.—Form of German See-Police.

Wir die Unterzeichneten beurkunden hierdurch für uns und unſere Rechtsnachfolger, daß wir, ein jeder von uns für die unten bei ſeinem Namen angegebene Summe, Verſicherung übernommen haben an Herrn . . . für Rechnung wen es angeht, auf . . . taxirt zu M. . . . im . . . Schiffe . . geführt vom Schiffer . . . von . . . nach . . . zur Prämie von . . . Procent.

Die aus dieſer Verſicherung für uns und d . . Verſicherten abzuleitenden Rechtsfolgen ſind zu beſtimmen nach den „Allgemeinen Seeverſicherungs-Bedingungen von 1867," welchen Bedingungen ſich beide Theile, insbeſondere auch in Betreff derjenigen Punkte unterworfen haben, in Anſehung deren die bezüglichen Artikel des Allgemeinen Deutſchen Handelsgeſetzbuches mit Abänderungen in dieſelben aufgenommen oder durch abweichende Beſtimmungen erſetzt worden ſind.

Beſondere Anzeigen oder Vereinbarungen.
Dieſe Verſicherung gilt nur für Seegefahr.
Dieſe Verſicherung iſt geſchloſſen durch . . .
So geſchehen zu . . den . . ten . . 18 .

59.—Bill of Exchange.

1,500 Frs.

Bordeaux, February 12th, 1892.

Six weeks after date, pay by this first of exchange to the order of M. Laffitte, the sum of fifteen hundred francs, for value received, which place to account.

Charles Gondemar.

Messrs. Smith and Son, Nancy.

Bon pour Frs. 1,500.

Bordeaux, le 12 *février*, 1892.

A six semaines de date, payez par cette première de change, à l'ordre de M. Laffitte, la somme de quinze cents francs, valeur reçue, que vous passerez suivant l'avis de

Charles Gondemar.

Messieurs Smith et Fils, à Nancy.

Fs. 1,500.

Bordeaux, 12. Februar, 1892.

Sechs Wochen dato zahlen Sie gegen dieſen Prima Wechſel an die Order des Herrn Laffitte den Betrag von Fünfzehnhundert Franken, Werth erhalten, und ſtellen ſolchen auf Rechnung laut oder ohne Bericht.

Charles Gondemar.

Herren Smith und Sohn. Nanzig.

60.—Promissory Note.

4,000 Frs.

I promise to pay on the 1st of March next, to the order of Mr. Nord, four thousand francs for value received by a bill of exchange drawn by him this day on Messrs. Louis & Mocquard, of Lyons, payable on the 1st of April.

Ch. Courtier.

Brussels, July 20th, 1892.

Bon pour Frs. 4,000.

Je paierai au premier mars prochain, à l'ordre de M. Nord, quatre mille francs, valeur reçue en une lettre de change qu'il m'a fournie, par lui tirée ce jour sur Messieurs Louis & Mocquard, de Lyon, payable au premier avril.

Ch. Courtier.

Fait à Bruxelles, le 20 juillet, 1892.

Fs. 4,000.

Am 1. März bezahle ich an die Order des Herrn Nord viertauſend Franken, Werth erhalten in einem Wechſel, heute von ihm auf Herren Louis & Mocquard, Lyon, per 1. April gezogen.

Ch. Courtier.

Brüſſel, 20. Juli, 1891.

61.—Bill of Exchange.

4,000 Frs.

Lyons, June 24th, 1892.

At two usances, pay this first of exchange to the order of M. Latour, four thousand francs for value received in cash, which place to account.

François Dupont.

Bon pour Frs. 4,000.

Lyon, le 24 juin, 1892.

À deux usances, payez par cette première de change, à l'ordre de M. Latour, quatre mille francs, valeur reçue comptant, que vous passerez suivant l'ordre de

François Dupont.

Lyon, 24. Juni, 1892.

An zwei Daten zahlen Sie gegen dieſe Prima an die Order des Herrn Latour viertauſend Franken, Werth baar erhalten, zu unſern Laſten.

François Dupont.

Fs. 4,000.

POLITICAL ECONOMY.—IX.

[*Continued from p.* 151.]

FREE TRADE AND PROTECTION.

We have shown that international trade is barter of goods for goods, and that it involves an international division of production, each country tending to produce what it is best fitted for, though frequently special circumstances may prevent its producing all the things it could produce best. And we said early in these lessons that the ideal of the economist was complete freedom of production and trade throughout the world, the greatest possible international division of labour, and the freest possible interchange of products. Now, "protection to native industry" (that is, putting duties on foreign goods so as to prevent their being sold at the same price as the home-made article) runs counter to this ideal. It is true that special reasons may sometimes be alleged for it which are outside the sphere of economics proper. Thus, it was supported in the last century partly on the ground that war might break out at any moment, and a country might then have much of its foreign commerce cut off, so it might be advisable for it to produce most of what it consumed. It is supported in America now on the ground that some European goods are produced by workmen who do not live nearly so well as the American workmen; and that if these goods are allowed to come in and compete with American-made goods, the American workman can only compete with the foreigner by sacrificing part of his wage, and so reducing his high standard of living to the low level of that of the latter. Most probably this argument is mistaken; the highest-paid labour is often found to be the cheapest in fact (as we have explained at p 277, Vol. VII), and the strong do not usually require protection against the weak. Protection is also supported on grounds which are more strictly economic—that variety of industry is good for society; and that, were the international division of labour strictly carried out, some of the wealth-producing capacities of a country would never be developed at all The United States, for instance, and Canada have great mineral resources; but the return to capital employed in agriculture is so much more speedy, that, were trade left quite free, many of these mineral resources would very likely not be opened up. It takes time to build railroads and work mines, and people do not care to wait many years for their profits when they can be sure of a large return on their capital at once. And Protection has sometimes been supported on the philosophic ground that the less a country is dependent on foreign countries, the more marked is its national character and the patriotism of its inhabitants. The most extreme and absurd form of this view was put forward by the German philosopher Fichte early in this century. He suggested that the foreign trade of a State should be entirely in the hands of the Government, which should keep it down as much as possible, admitting only such foreign goods as were absolutely necessary; and that if possible the inhabitants should renounce the rest, and content themselves with home-made substitutes—for coffee, silk, and castor oil, for instance! This view reduces the argument to an absurdity, but milder forms of the same idea now often appear in Protectionist arguments, especially in America.

Now, as was said in lesson I., Political Economy does not give practical conclusions, but suggests certain principles on which we may form practical conclusions, though in doing this we may have to take special circumstances into account which are outside economics. In the last century there were strict laws interfering with the shipment of British goods in foreign ships or in British ships manned partly by foreigners. The chief object of these restrictions was to encourage the employment of capital in building English ships and engaging English seamen, in order that in time of war English seamen might be available for war-ships. If there were no other way of manning the navy, we should probably all say with the great free-trader, Adam Smith, that "defence is more important than opulence," and that the restrictions were quite right. But as the navy does not now ordinarily draw its crews from merchant ships, these laws have been abolished. Such a reason for Protection is a special reason outside economics. But among the principles economics suggests for guidance in dealing with this question are—

(1) International trade being barter of goods for goods, if we want to increase our home production, that part of it which is exported can best be increased by giving greater facilities for importing—*i.e.*, taking off duties on imports.

(2) The person whose advantage is to be considered is the consumer; for everybody consumes certain kinds of goods, but only some persons are concerned in producing a particular kind of goods, and the capital and labour so concerned would eventually—though not without considerable difficulty and inconvenience—be diverted into some more profitable employment.

The people who usually support Protection are mostly capitalists, and sometimes workmen, concerned in producing the kinds of goods which suffer most from foreign competition. Naturally they look on the question from their own point of view. But in the interest of the nation, we should look at it from the point of view of the consumer. The admission of foreign corn duty free enables each of us to spend more in bread, if he requires to, and to have more money to spend on other things. To put a duty on corn was to make the profits of corn-growing higher than they would naturally have been, and, by raising the price, to make the consumer have less to spend on other things and less to save: so that the capital of the country did not increase so fast as it might otherwise have done.*

* The difference between the consumer's and the producer's point of view may be illustrated by a little story. Representatives of England and Austria were once negotiating a com-

(3) Economically, Protection is wasteful. It tends to draw capital and labour into trades which are not naturally profitable, but which are made profitable at the expense of the consumer. Very frequently they are not profitable, in the long run, even after they are protected, because the "Protection" they are under raises the profits to such a tempting figure that more capital goes into the trade than there is scope for, and then competition brings down the profits. If left alone, capital will seek naturally profitable channels. If "protected," it will be drawn into employments made profitable artificially by taxing the consumer. Then the national wealth, the national capital, and the national power of employing labour will increase less rapidly than they would otherwise.

"Very good grapes," said Adam Smith, "can be grown in Scotland in forcing-houses, and very good wine may be made from them, at a cost of about thirty times that of imported French wine. If this be absurd, so is it absurd (only in a less degree) to produce anything at home that can be more cheaply produced elsewhere." But the world outside of England does not see its way to take this common-sense view even now.

The high wages which occur under Protection seem tempting; but it must be remembered that it is nominal wages rather than real wages which are high. It is quite impossible to protect one set of trades only; directly one set is protected, others begin to demand consideration; and as Protection tends to raise price—though this tendency is sometimes checked by the competition of inventors, who to satisfy the demand for goods at the old price reduce the cost by better methods of production—the cost of living becomes greater, that is, real wages tend to decline. For, as we shall presently see, indirect taxation tends to raise the price of the goods taxed by more than the amount of the tax. And when once protective duties are put on, so many people are interested in keeping them up that it is very difficult to get them taken off.

We may notice that foreign Governments frequently encourage special manufactures (*e.g.*, beet sugar) by giving a bounty on the export of the product—usually a return of the taxes the product is estimated to have paid. Such a system, of course, means the encouragement of a special trade at the expense of the taxpayers generally.

TAXATION.

The action of Government on the accumulation of wealth in the country is so important for good or evil that some economists deal with it by itself. Undoubtedly, however, the most important way in which a Government can exercise this influence is by taxation; and we shall confine ourselves to this part of the subject. The influence of the action of Government on the national wealth would indeed require a very large book to itself.

The main principles of taxation as laid down by Adam Smith are four in number:—

(1) The amount paid in taxes by each citizen ought to be proportionate to the benefits he enjoys from his membership of the State.

(2) The amount each citizen pays should be so estimated and imposed that he can ascertain clearly what it is.

(3) Every tax should be paid at the time and in the manner most convenient to the taxpayer.

(4) Every tax should be so contrived as to take as little as possible from the taxpayer beyond what it brings into the State.

Taxes are commonly classed as direct and indirect. A direct tax is paid in the first instance by the person on whom it falls ultimately. An indirect tax is paid in the first instance by some other person than the person who ultimately pays it.

Thus the English income-tax, with some exceptions, is a direct tax. But the duty on tobacco or any other customs duty is an indirect tax, because it is paid in the first instance by the importer and he puts it on to the price of the goods; and the consumer ultimately pays it in the price.

It will be noticed at once that rule No. 2 above makes in favour of direct taxation as against indirect. So, in fact, does rule No. 4, for this reason, that some time elapses between the importation of goods and their purchase by the consumer; and that every trader concerned has in his turn to advance the amount of the duty on them, and wait to recover it from the next purchaser. He, in fact, requires more capital to trade with than he would otherwise; he expects to make interest on this capital; and so the price to the consumer tends eventually to be raised, not only by the amount of the duty but by a share of the interest on all the extra capital which the existence of the duty has caused to be employed in getting his share of the goods to him.

Rules 3 and 4 are partly complied with by the device of *bonded warehouses*. Dutiable goods are

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mercial treaty by which each country bound itself to reduce its duties on certain classes of goods produced by the other. The English representative suggested that Austria should admit English herrings duty free. "What will you give us in exchange for this privilege?" asked the Austrian. "Why, more herrings, of course," was the reply. But the Austrian could not see the question in this light, because he took the old-fashioned view that the great thing for a Government to aim at is to get markets abroad for the national products, and that promoting the convenience and comfort of its subjects generally is quite a minor point stored in these by the importer, and the duty is only paid when the goods are taken out. Thus the importer may pay the duty on a cargo bit by bit, as he sells portions of the goods; and so he can carry on his business with rather less capital and need not advance the duty on the whole at once; while if the goods are re-shipped to some foreign country, he never pays the home duty at all.

One great objection to Protection is that it encourages indirect as against direct taxation. Some forms of indirect taxation conflict with rule 2. When a duty *ad valorem* is charged—that is, a duty proportioned to the value of the goods imported—it is often found that the opinions of the importer and the customs officials as to the value differ widely; and, of course, neither is infallible. So that either the importer or the Government is extremely likely to be unfairly treated.

Adam Smith's first rule (it must be noted) is a mere ideal. It may be interpreted as meaning that rich citizens ought to pay more in proportion to their means than poor—that (*e.g.*) the income-tax ought to be progressive—though this is objectionable in other ways, as interfering with the natural increase of capital; or that a certain minimum income, representing the necessaries of life, should be exempt from taxation. But equality of sacrifice (though very desirable) is hardly attainable.

Taxes on rent (in the economic sense) and succession duties are among those most favoured at present; the latter because it cannot be said that a person has an absolute moral claim to dispose of his property after his own death, though for various reasons it is desirable his wishes should be followed. But as he would not have been able to accumulate property at all but for the existence of the security assured to it by the State, it seems fair that the State should take some share in the result at the moment when the property does not absolutely belong to anyone.

The desirability of taxes on ground rents has been hotly disputed. Mr. George's scheme, before referred to, of a tax equal to the rent seems to burden one kind of property unduly with all the weight of taxation—which, however fair it might be if society were starting afresh, is hard on the present owners of land, who have bought it on the presumption it would yield them an income. Still there is no doubt that much of the value of land is due to the increasing demand for it due to the growth of society. And it is argued that as society has created the value it should share in it. It is true other kinds of property often rise in value without any action by the owner, but they do not do so regularly: it is impossible to devise a scheme which shall reach such strokes of luck, and the possibility of such strokes is a great encouragement to the prosecution of some industries of great use to society—mining for instance. The question bristles with difficulties, and its solution must be the work of the future.

We have only been able very briefly to touch on some few of the leading points connected with taxation. It must be the object of an elementary work on Political Economy rather to indicate problems than to solve them, and to suggest general principles which may guide the solution.

HEAT.—III.

[*Continued from p.* 148.]

COLD PRODUCED BY EVAPORATION.

WHEN water is converted into vapour, much heat is rendered latent. The porous water-bottles so frequently used in hot weather act in this way: a portion of their contents slowly percolates through the unglazed ware and evaporates from the surface, absorbing from the vessel the heat required to convert it into vapour.

If ether or any volatile liquor be dropped on the hand, a sensation of cold will be at once produced, and this will be felt more distinctly if the hand be waved about, or a current of air be driven over it, so as to accelerate the evaporation. The same thing occurs to a less extent with water. An important application of this fact is now made in surgery. A stream of finely divided ether spray is blown upon any part of the body, and by its rapid evaporation produces cold enough to freeze the flesh, and thus render it insensible to the cut of the surgeon's knife. In minor operations this plan of producing local insensibility is frequently adopted.

By the arrangement shown in Fig. 18 water may be frozen by its own evaporation. A shallow vessel, filled with strong sulphuric acid, is placed under the receiver of an air-pump, and over it is supported a thin metal vessel A, containing water. As soon as the air is exhausted, vapour begins to rise, and the vessel would speedily become charged with it, did not the acid absorb it as fast as it is formed. The evaporation of each fresh portion of vapour lowers the temperature, and this continued abstraction of heat soon turns the water into a lump of ice.

Some vapour is given off at temperatures far below the boiling-point. The air, in fact, is always more or less charged with it. There is, however, a certain limit to the amount it can contain at any temperature, and if, when it is fully charged, the temperature fall, a portion of the vapour is precipitated in the form of rain.

The point at which this vapour in the air begins to be precipitated is called the *dew-point*, and the temperature of this depends upon the amount of vapour present. When on a clear night any objects become cooled below this point, the air in contact with them deposits its moisture, and they become wet with dew. Hence, as will be seen, it follows that those objects which radiate heat most freely receive most dew.

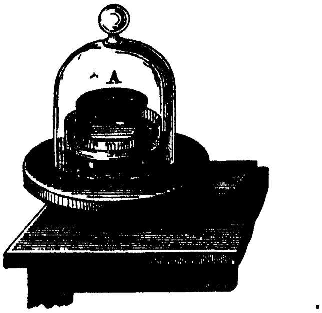

Fig. 18.

Fig. 19 shows the instrument used for ascertaining the dew-point. A glass tube has a bulb blown at each end, and one of them, A, is partly filled with ether. This has been boiled and the tube sealed while the vapour was issuing, so that no air is present. Inside this limb is a delicate thermometer; the other limb, B, is wrapped round with muslin. Ether is now dropped upon this, and by its evaporation lowers the temperature. A portion of the ether in A distils over, and the temperature of the liquid, therefore, diminishes. As it sinks the bulb is watched, and the thermometer is read at the moment when vapour begins to form on the outside of it. To make this more clearly visible, the bulb is often made of black glass. An ordinary thermometer on the stand of the instrument shows the temperature of the air, and the difference between the two is thus easily noted.

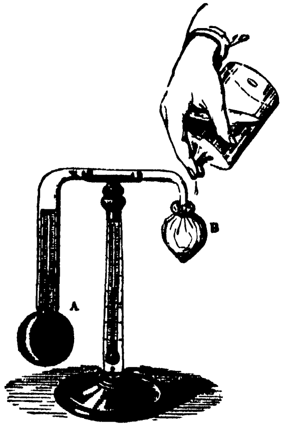

Fig. 19.

LIQUEFACTION BY PRESSURE AND LOW TEMPERATURE.

By means of very high pressure and extremely low temperatures all gases have been liquefied. Carbonic acid, when exposed to a pressure of about thirty atmospheres, becomes a liquid, and if this be allowed to escape into the air, it freezes by its own evaporation, and becomes converted into flakes resembling snow. When these are mixed with ether, the evaporation is very rapid, and an intense degree of cold is produced, so that mercury may easily be frozen by means of it. Hydrogen, oxygen, nitrogen, and other gases, which prior to 1877 were considered permanent gases, have since been liquefied by low degrees of cold and high degrees of pressure.

RADIANT ENERGY FROM HOT BODIES.

Another effect of heat is to produce light. Ordinary flame affords an illustration of this fact, the heat arising from the chemical combination being the source of the light. Metals, too, when exposed to a high temperature, become luminous. A low red heat is usually assumed at from 1,100° to 1,300° F., while a dazzling white indicates from 2,500° to 3,000° F. There is, however, great difficulty in measuring these high temperatures with any degree of accuracy. Wedgwood's pyrometer is sometimes employed for the purpose; it consists of metal bars placed about half an inch apart at one end, but a little nearer at the other. Clay cylinders are then made of such a size that, when baked at a red heat, they just fit the wider end. When exposed to a very high temperature, they contract, and the extent of the contraction is shown by the distance they pass between the bars. The air thermometer is, however, more reliable in its indications. A platinum vessel filled with air is exposed to the source of heat, and the expansion ascertained by suitable means; from this the temperature is easily deduced.

If a powerful electric current be made to pass along a thin platinum wire, it will render it white-hot, and a considerable amount of light will be produced, showing again the luminous effects of heat. We must not, however, suppose that heat is always accompanied by light, or light by heat. The electric lamp furnishes us with a very brilliant light and at the same time an intense heat, so that we have both the luminous and the calorific rays in a beam from it. If now we cause this beam to pass through a glass trough filled with a solution of alum, the luminous rays will pass on as before, but all or nearly all of the heat will be intercepted. The alum solution serves, in fact, as a filter to remove the thermal rays. Now remove the glass trough, and substitute for it a slab of rock-salt thickly covered with lamp-black, so that no light can penetrate it. On placing a differential thermometer, or thermo-electric pile, in the place where the luminous rays had previously been brought to a focus, we shall find that nearly all the heat has passed through the rock-salt, though the luminous rays have been intercepted. By suitable arrangements we may actually succeed in igniting various substances by means of this non-luminous heat. We see thus that the luminous and the heat-giving rays may be entirely separated from one another.

MECHANICAL EFFECTS OF HEAT—THE MECHANICAL EQUIVALENT.

We have now to notice the mechanical effects of heat, and to learn how it may be converted into work. To ascertain the mechanical equivalent of heat—that is, the amount of work that can be accomplished by a given quantity of heat—is a difficult problem. It has, however, been solved, mainly by the patient researches of Drs. Joule and Meyer. The following experiments will give an idea of the process adopted by the latter:—

Let A B (Fig. 20) be a tube closed at its lower end, having a sectional area of one square inch; and let C be a piston fitting it air tight, and capable of moving up and down without friction. Also let C be supposed to weigh 15 lb. 12 oz., and to be 492 inches from the bottom, the air below being at the freezing-point. Now raise the temperature of the air 1° F., and since the coefficient of expansion is $\frac{1}{492}$, the piston will rise one inch, and be 493 inches from the bottom; and thus, for every degree the temperature is raised, the piston will rise an additional inch. If then, the temperature is raised 492° F., the volume of air will be doubled. In this case work has been done by the heat, and that work has consisted in raising the piston and the air above it, which together press with a force of 15 lb. + 15 lb 12 oz., or 492 oz., to a height of 492 inches.

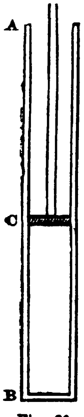

Fig. 20

Now try the experiment in a different way, and ascertain the additional weight requisite to keep the piston in its place, while the temperature varies. We shall find that if the temperature is raised 1° F., one ounce must be added to the piston to keep it stationary; if 2° F., two ounces, and so on. Hence, if the temperature be raised 492° F., 492 oz. must be placed on the piston to keep the volume the same. Compare now these two experiments. In one case we have raised the temperature, keeping the pressure constant while the volume increased; in the other case the volume has been kept constant. The same amount of air has been raised in each case to the same temperature; but *a different quantity of heat has been required;* for investigation shows that if 10 grains of any combustible material are required when the *volume* is kept constant, 14·21 grains of the same material would be required when the *pressure* remains unaltered. The extra 4·21 grains, then, have been employed in raising the weight, and have thus been converted into work.

Now suppose we have a vessel two feet deep with a movable piston one square foot in area and half-way down the vessel, so that there is just one cubic foot of air in the vessel. The temperature is raised 492° F., so that the air will occupy double the space; and as the pressure on the surface of the piston is 144 × 15 lb. = 2,160 lb., it will have lifted this weight one foot, or, in other words, performed work amounting to 2,160 foot-pounds. The weight of the cubic foot of air is 1·29 oz., and as will be explained shortly, the amount of heat required to raise this to any temperature would only raise 0·31 oz. of water to the same temperature, the air having less capacity than the water. The total amount of heat, then, which has been received by the air is sufficient to raise 0·31 oz. of water 492° F., which is the same as raising 9½ lb. 1° F. Of this amount, $\frac{421}{1421}$ is, as explained above, employed in driving back the air, while the rest serves to raise the temperature. Now, $\frac{421}{1421}$ of 9½ lb. is about 2·8 lb., and thus we find that the amount of heat required to raise 2·8 lb. of water 1° F. is sufficient to elevate 2,160 lb. to a height of 1 foot. Dividing 2,160 by 2·8, we get a quotient of 772 nearly, that is, the quantity of heat required to raise a pound of water 1° F. will perform work equivalent to 772 foot-pounds. As, however, the thermal unit is usually taken as the quantity required to raise a pound of water 1° in the Centigrade scale, the equivalent must be increased by $\frac{4}{5}$, and will be found to be 1,390 foot-pounds.

By a number of different experiments, conducted with great care and patience, Dr. Joule arrived at a very similar result, and we may therefore safely take this as the true equivalent. The amount seems very large, especially when we consider the great amount of heat produced by the combustion of various substances. A pound of charcoal, for instance, by its combustion produces 8,000 units of heat, and thus generates a force sufficient to raise a weight of nearly 5,000 tons to a height of one foot.

We do not wonder, since this is the case, that means should have been sought of utilising the heat of the sun's rays, which, on a bright summer day, are calculated to impart about 5 thermal units per minute to each square foot of surface, placed so as to receive them perpendicularly. No important practical results have, however, been obtained at present from these attempts, though several inventors have claimed for their machines the power of turning this force to good account. It is, however, scarcely probable that, in an economical point of view, they would be able to compete with coal and other articles of fuel.

CONVERSION OF HEAT INTO WORK.

Illustrations of the conversion of heat into motive power, as described in our last lesson, are frequently met with. One of the best of these is afforded by the steam-engine. If we enter any large factory where steam power is employed, we find different machines at work. In one place, it may be, heavy weights are being raised or moved ; in another, large pieces of metal are being turned or cut into shape, or other operations being carried on with apparent ease by the aid of machinery. For all this a considerable amount of force is evidently required, and the question arises, Whence does all this force come ? The machines, we know, cannot create it ; it is evident, therefore, that the source of it must be sought for in the heat produced by the combustion of the fuel in the furnace.

If the supply of fuel be diminished, and consequently a smaller quantity of heat be produced, less work will be accomplished ; and if we could in any way ascertain exactly the amount of heat carried away by the hot air up the chimney, and that lost by radiation and conduction, and dissipated in other ways, we should find that there was still a portion of that produced by the combustion of the fuel left unaccounted for ; this balance would be exactly proportional to the amount of work that had been performed. Allowance must, of course, be made in this calculation for the force required to impart motion to the machinery itself.

A portion of the force thus produced is often re-converted into heat. If we stand by a drilling-machine, or lathe, in which a piece of iron is being shaped, we shall find that the turnings or borings are frequently too hot to be touched with any degree of comfort, although the mass of metal and the tool were both quite cold. The motion of the machinery is here partially transferred into one of motion of the particles of the iron, which manifests itself in the form of heat. In this way we learn that heat, like matter, cannot be destroyed, but only converted into other modes of motion.

SPECIFIC HEAT.

In our first lesson we selected as our thermal unit the quantity of heat requisite to raise a pound of water 1° in the Centigrade scale. Now, we should at first suppose that the same amount of heat would raise the temperature of a pound of any other substance to the same extent. Experiment, however, the philosopher's grand resort, soon shows us that this is not the case.

Let us provide three sources of heat of equal intensity—or, better still, an oil or water bath, capable of holding three large beaker glasses. Equal weights of water, oil of turpentine, and sulphuric acid should now be put in these, and a thermometer should likewise be placed in each beaker. Now apply a powerful source of heat, such as a Bunsen's gas-burner, and watch the thermometers. The heat applied to each vessel is, of course, the same, but the thermometer in the sulphuric acid will soon be seen to be rising more rapidly than the others, that in the turpentine comes next, while that in the water is lowest of all. If we now further observe the time taken by each to attain any given temperature, as, for instance, 200° F., we shall learn that the water takes nearly three times as long as the acid, and more than twice as long as the turpentine.

Now in each minute each must receive the same quantity of heat ; it is clear, then, that different amounts of heat are required to raise the same weights of different substances to the same temperature. This fact, which is a very important one, is usually accounted for by saying that different bodies have different *capacities* for heat, or, as it is more commonly expressed, different *specific heats*.

Another experiment, which the student may easily repeat, will render this much more clear. Take a number of balls composed of various substances such as lead, copper, iron, tin, bismuth, and glas (Fig. 21). Immerse them all for a short time in ho oil of a known temperature, or in some other way bring them all to one temperature, and then place them a little distance apart on a sheet of wax about half an inch thick. The balls will melt the wax at very different rates. If their temperature is high at first, the glass will soon melt through the wax, and fall ; the iron and copper likewise sink rapidly, and in a short time they too will pass through it, the iron being a little in advance of the copper. The tin ball comes next, and may just be able to be seen underneath, while the lead and bismuth sink but a little way, and

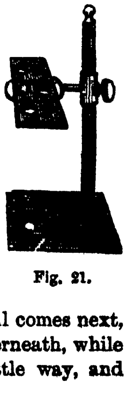
Fig. 21.

there remain; though they had the same temperature as the rest, the *amount* of heat they possessed was only sufficient to melt a very small portion of the wax.

This experiment suggests to us a mode of ascertaining the specific heat of different bodies which is frequently adopted. It consists in ascertaining the amount of ice which a given weight of the substance is able to melt after being raised to a high temperature. We know that 80 thermal units are required to melt a pound of ice. The substance to be tested is therefore carefully weighed, and raised to a high temperature, which is ascertained and noted. It is then placed in a dry cavity in a lump of ice, covered over by a slab of the same material, and left until it is reduced to the freezing-point. The moisture is then carefully absorbed from it and from the cavity by a previously weighed cloth, and thus the exact amount melted is at once shown. From this the specific heat may be calculated, and in this way a table can be drawn up, showing the specific heats of different substances.

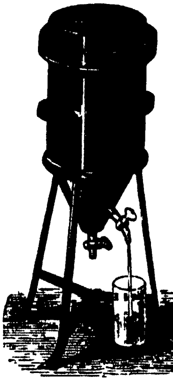
Fig. 22.

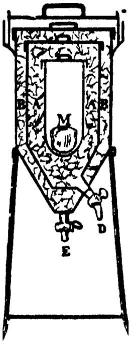

Fig. 23.

Water is always taken as the standard, and the specific heat of other bodies compared with that of an equal weight of this substance. This is partly done as a matter of convenience; it is found, however, that the specific heat of water is greater than that of any other substance. The fact is an important one in the welfare of the globe. The sea, as is well known, always tends to preserve a uniform temperature, so that islands do not suffer from the same extremes of heat or cold as continents do. The reason is that, on account of its great specific heat, a large amount of heat is requisite to produce even a small variation in the temperature of any mass of water, and hence it is very slow in manifesting these changes. In this way the sea serves as a great equaliser of temperature, absorbing a great deal of heat when the temperature is high, and giving it out again as it falls.

As it is often difficult to procure a lump of ice large enough to use in the mode described above, the apparatus represented in Fig. 22 was devised and used by Lavoisier and Laplace in their investigations on specific heat. It consists of three concentric metal vessels fitted with covers, as may be seen more clearly by the sectional view (Fig. 23). The substance, M, to be tested is weighed, and its temperature ascertained; it is then placed in the inner vessel, the spaces between that and the next, and also between the middle and outer vessels being filled with pounded ice. The outer layer prevents any heat from without reaching the middle vessel, and the water produced from this issues by the tap E. A separate tap, D, carries off the water melted by the heat of M; this is received in a glass, and measured or weighed, and shows the amount of heat given off by the substance in cooling. The main drawback to this apparatus arises from the fact that some of the water remains among the interstices of the ice, and therefore the amount received in the glass is somewhat less than that actually melted. If M weigh exactly a pound, and it be raised to the temperature 142° F., the specific heat is at once known by learning what portion of a pound of water is melted. A quarter of a pound in the vessel would indicate a specific heat of 0·25, and so on. When the substance has a different weight, or is raised to a different temperature, allowance must be made by a sum in proportion.

There is another way in which the differences in the specific heats of various substances may be shown and ascertained; this is known as the method of mixtures. If we take a pound of water at 100° F., and another at 150° F., and mix them, the temperature of the mixture will be the mean of the two, or 125° F. If however, instead of the pound of water at 150° F., we take a pound of mercury at the same temperature, the temperature of the mixture will only be about 102° F., showing how much less heat was contained in the mercury than in the water. The mercury has lost 48° F., while the water has only gained 2° F., and yet we know that whatever amount of heat the one has lost, the other must have gained. The mode of ascertaining the specific heat of any substance in this way is comparatively simple. Suppose, for instance, we have a piece of copper weighing fifty ounces; it is brought to a temperature of 200° F., and maintained at that for a short time, so that every part may be equally heated. It is then immersed in 100 ounces of water, at a temperature of 60° F., and after it has had time to share its heat with the water, which is gently stirred to aid this, the temperature of the whole is found to be 66½. The water here has gained 100 (66½ – 60) = 650° F., while the copper has lost 50 (200 – 66½) = 6675° F., and hence its specific heat is $\frac{650}{6675}$, or 0·096. The specific heat of liquids may also be learnt by noting the time they take to cool from a high temperature, as those which gain heat most rapidly lose it likewise most rapidly. The small specific heat of mercury—it being only about $\frac{1}{30}$th that of water—renders it specially suitable for filling thermometers, since it rapidly acquires the temperature of any liquid in which it is immersed, and does so, too, without greatly lowering its temperature. The annexed table gives the specific heats of a few of the more common substances :—

Water . .	1·0000	Sulphur .	0·2026	Copper . .	0·0952
Alcohol . .	0·6608	Glass . .	0·1977	Silver . .	0·0570
Turpentine	0·4259	Iron . . .	0·1188	Mercury .	0·0338
Charcoal .	0·2411	Zinc . . .	0·0955	Gold . .	0·0324

DULONG AND PETIT'S LAW.

Now, in the above table no relation whatever is visible between the different numbers; but if, instead of taking equal weights, we take the substances in the proportion of their molecular and atomic weights, we shall find a simple law. To check this, let us multiply the numbers placed above against the elementary bodies by the atomic weights of those bodies. Thus :—

	Atomic weight.		Specific heat.		
Iron	56	×	0·1188	=	6·37
Zinc	65	×	0·0955	=	6·20
Silver . . .	108	×	0·057	=	6·15
Mercury . . .	200	×	0·0333	=	6·66
Gold	197	×	0·0324	=	6·38

This product is the *atomic heat* of the metal. Similarly, if we take the molecular weights of compounds and multiply by their specific heats, we get a product which is equal to the sum of the atomic heats of their constituents. Thus :—

	Molecular weight.		Specific heat		
Silver Chloride, AgCl	143·5	×	0 089	=	2 × 6·4

It will be seen now that there is evidently some hidden link of connection between chemical composition and specific heat.

CONDUCTION OF HEAT.

It now remains for us to inquire into the ways in which heat may be communicated from one body to another, and these may be classed under three different heads—conduction, convection, and radiation. The former of these is most common, and must be spoken of first. If we take a rod of glass, and another of iron, and place one end of each in the flame of a spirit-lamp, these ends will soon become red-hot. After remaining so a few minutes, the iron rod will be too hot to be touched within a considerable distance of the hot end, whereas the glass rod may be handled with impunity almost up to the heated part. In the case of the iron the motion of the molecules is transferred from one to another till, in a little time, the whole rod becomes

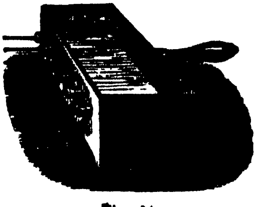

Fig. 24.

transmit these vibrations with the same facility, and hence it is called a bad conductor.

The apparatus shown in Fig. 24 illustrates the difference in the conducting powers of various bodies. A metallic trough has a number of holes made along one side. These are closed by corks, through which rods of various substances—as wood, glass, and metal—are passed. Melted wax or tallow is now smeared on the rods, and allowed to cool, and the trough is then filled with boiling water. The rate at which the heat is conducted along the different rods is at once seen by observing the distances to which the wax is melted along them.

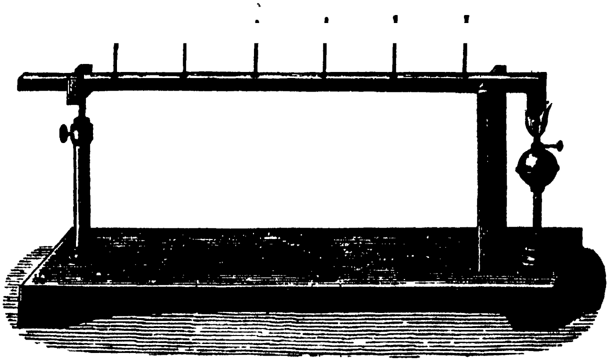

Fig. 25.

Fig. 25 shows a more elaborate plan of ascertaining conducting power. A bar of the metal to be tested has cavities made along it at regular distances of three or four inches. Mercury is now poured into these, and a delicate thermometer is put in each. Heat is then applied at one end, and the rate at which it travels along is shown by observing the readings of the different thermometers. Other experimenters have done away with the cavities, and employed a flat bar, testing the temperature at different parts by means of a thermo-electric pile. It is found in this way that the conducting power of different metals varies very greatly, that of silver, which is the greatest, being expressed by 100, while that of German silver is only 6. One important fact which strikes us here is that their conducting power for electricity seems to correspond closely with that for heat.

We shall now understand the reason why metals and other bodies feel cold to the touch. They are good conductors, and therefore carry away rapidly the heat from the part of the body with which they are in contact; bad conductors, on the other hand, only rob us of a small amount. As a general rule, all organic substances, and those which are loose in texture, are bad conductors; hence these are selected as the materials for our clothing. A great mistake is often made in supposing that clothing actually imparts heat; the real fact is, that it merely keeps in the heat which is produced in the system. The human body is considerably above the surrounding air in temperature, viz., at 98·4° F., being kept so by that portion of our food which is burnt in the system. This heat would be very rapidly dissipated, and imparted to the air and surrounding objects, did not our garments intervene and, by their non-conducting power, prevent its escape. A further illustration that this is really the case is seen in the fact that ice carts are carefully covered over with blankets, certainly not with the intention of keeping the ice warm, but for the sake of keeping out the warmth of the air, which would rapidly melt it.

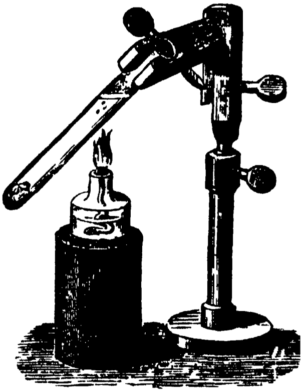
Fig. 26.

Air is a bad conductor; hence loose bodies, such as sawdust, shavings, or tow, which enclose a large amount of air in their interstices, are frequently employed to exclude cold. Water, likewise, is a very bad conductor. This at first seems unlikely, when we remember how quickly a quantity of water may be brought to the boiling point; but we shall soon see that this is not heated by conduction, but by convection. To prove this, we may take a large jar of water, and, having placed a delicate thermometer at the bottom, set light to a tin saucer of spirit floating on the top. A large amount of heat will thus be produced, and the saucer will soon become intensely hot; the thermometer at the bottom, however, will remain unaffected for a long time. A simpler way of proving this fact is shown in Fig. 26. A test-tube is filled with ice-cold water, some fragments of ice being kept at the bottom. A spirit-lamp may then be applied to the upper part, and the water there will boil for a long time before the ice at the bottom is melted. This would not be the case if the water could conduct the heat.

APPLIED MECHANICS.—XVII.

[*Continued from p.* 156.]

CYLINDRIC, CONICAL, AND FLAT SPIRAL SPRINGS—RESILIENCE OF A SPRING—CENTRIPETAL ACCELERATION AND CENTRIFUGAL FORCE—APPLICATION OF CENTRIFUGAL FORCE—HARMONIC MOTION—EXAMPLES

In these the last lessons of the series it will be necessary to refer briefly to various matters which have been left over until now, and which are so important that they must not be omitted, even at the risk of making the lessons of a somewhat disjointed and miscellaneous character. The strength and stiffness of springs used in various machines and appliances is of great importance, and opens up a very wide and important subject, but we shall refer only very briefly to those kinds of springs in most general use. Spiral springs may be said to consist of two classes: (1) those composed of wire which has been wound on a *cylindric* core or mandril, and (2) those in which the spirals follow a conical surface. The former are in common use, and known to everyone as "spiral springs"; the latter are used for buffer springs and such purposes, and are generally called "volute" springs. The commonest—and, perhaps, most useful—of all springs is the ordinary cylindric spiral spring of round or square wire. If such a spring is elongated, the wire is everywhere *twisted;* if the spring as a whole is *twisted*, the wire is *bent*.

Fig. 100 is a picture of such a spring; and in considering the forces acting on it we may neglect its own weight, which forms a force usually small in comparison with the others. Consider the forces acting at a section P (Fig. 101) of a spring of round wire. Evidently the molecular forces at P must balance all the forces acting on the spring from that section to the lower end. The load W gives at P a twisting-moment = Wr, together with a shearing force = W, which, however, may usually be neglected. Now, if the twisting-moment Wr acts at P, how much will the whole length of wire above that point twist?

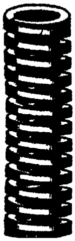

Fig. 100.

Our law for the torsion of shafts helps us here. We saw that the twist per inch of wire or shaft, due to a twisting-moment M, is—

$$\frac{32M}{\pi N d^4},$$

d being the diameter of the *wire*. From this, it follows that the twist (in radians) in l inches of wire, due to the load W, is—

$$\frac{32Wrl}{\pi N d^4}.$$

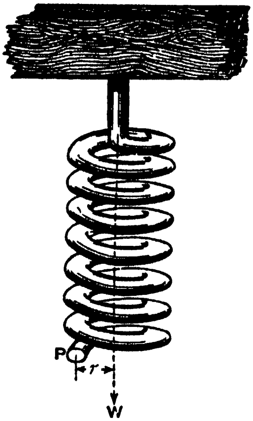

Fig. 101.

Now the connection between twist in wire and elongation of spring is most readily seen from the following experiment. In Fig. 102 the spring D E and the wire A B are composed of the same length of wire, and are taken off the same coil—are, in fact, similar in all respects, the mean diameter of the coils of the spring D E being the same as the mean diameter of the circle described by the cord C B, wound on the pulley B. It is found that when the spring is loaded with different weights, the pointer at G always descends *twice as far* as the pointer at F, showing that the length of cord let off the pulley B is *equal to the elongation of the spring.*

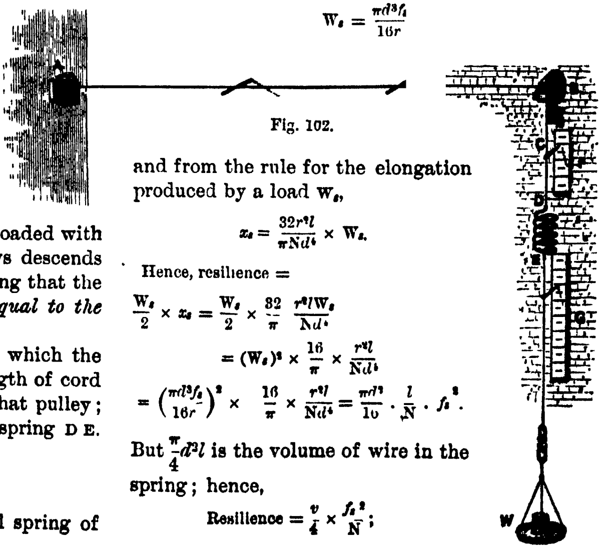

Fig. 102.

If θ is the angle (in radians) through which the pulley B or the wire A B twists, the length of cord let off is $r\theta$, where r is the radius of that pulley; hence, $r\theta$ is also the elongation of the spring D E. But, as already stated above,

$$\theta = \frac{32Wrl}{\pi N d^4} \quad \therefore \; r\theta = \frac{32Wr^2 l}{\pi N d^4},$$

or the elongation x of a cylindric spiral spring of circular section, d inches in diameter—the length of wire in it being l inches, mean radius of coils r inches, modulus of rigidity N—due to a load of W pounds, is given by the rule—

$$x = \frac{32Wlr^2}{\pi N d^4}.$$

This is the law of stiffness for such a spring.

With regard to its strength, it is generally necessary to know the greatest load it will bear without getting a "permanent set." This is obtained from the rule for the strength of shafts—

$$M = \frac{\pi d^3}{16} f_s,$$

f_s in this case being the shear stress corresponding to the elastic limit, and M = Wr.

Hence, the load required is—

$$W_s = \frac{\pi d^3 f_s}{16 r}.$$

This is the law for the *strength* of a spiral spring. It will be seen that this load is *independent* of the length of wire in the spring. We need scarcely add that x may be either elongation or shortening of the spring, according as the load is applied.

RESILIENCE OF A SPIRAL SPRING.

The amount of energy such a spring as we have been discussing will store without being hurt is a matter of great importance. It is evidently $\frac{W_s}{2} \times x_s$, where W_s and x_s are the load and elongation corresponding to the elastic limit.

We have already seen that—

$$W_s = \frac{\pi d^3 f_s}{16 r}$$

and from the rule for the elongation produced by a load W_s,

$$x_s = \frac{32 r^2 l}{\pi N d^4} \times W_s.$$

Hence, resilience =

$$\frac{W_s}{2} \times x_s = \frac{W_s}{2} \times \frac{32}{\pi} \, \frac{r^2 l W_s}{N d^4}$$

$$= (W_s)^2 \times \frac{16}{\pi} \times \frac{r^2 l}{N d^4}$$

$$= \left(\frac{\pi d^3 f_s}{16 r}\right)^2 \times \frac{16}{\pi} \times \frac{r^2 l}{N d^4} = \frac{\pi d^2}{16} \cdot \frac{l}{N} \cdot f_s^2.$$

But $\frac{\pi}{4} d^2 l$ is the volume of wire in the spring; hence,

$$\text{Resilience} = \frac{v}{4} \times \frac{f_s^2}{N};$$

or the resilience per cubic inch is—

$$\frac{f_s^2}{4N} \text{ inch-pounds.}$$

We have then the important result, that the amount of work a spring will store is simply proportional to the *volume of stuff* in it; and it does not make any difference, as regards resilience, whether the stuff is in the shape of a long thin or short thick wire. A similar result was obtained for a bar in tension.

In the foregoing we have assumed that the angle which the spiral makes with a plane normal to the axis of the spring is zero. In most springs it is small. The theory of the stiffness of spiral springs, taking the magnitude of this angle and the different shapes which a right section of the stuff may have into account, is somewhat complicated. We cannot go fully into the matter here, but shall merely indicate the practical result of the investigation as far as regards a few of the commoner sections used in such springs. If the section is a circle, and the angle of coiling nearly zero (as in the case we have just taken up), there is no tendency for the ends of the spring to rotate; but if the section is not circular, there is such a tendency, especially if the angle is considerable—the rotation for a given axial deflection increasing as the section departs more and more from the circular shape.

The following is a useful general rule for the axial deflection, x, of a cylindric spiral spring acted on by an axial force W.—

$$x = Wlr^2\left(\frac{\cos.^2 a}{A} + \frac{\sin^2 a}{B}\right),$$

where a is the angle of the spiral measured as referred to above; A and B being constants expressing respectively the torsional and flexural rigidities of the wire of which the spring is composed. Values of A and B for a few sections are given below, N and E having the meanings already assigned to them:—

Shape of Section.	Value of A.	Value of B.
Circle.	$\frac{\pi N d^4}{32}$.	$\frac{\pi E d^4}{64}$.
Ellipse, diameters D and d Major diameter parallel to axis of spring.	$\frac{\pi N D^3 d^3}{16(D^2 + d^2)}$	$\frac{\pi E D d^3}{64}$.
Square, side S.	·14058NS^4.	$\frac{ES^4}{12}$.
Rectangle; breadth b, thickness t, side b parallel to axis.	$\frac{N}{8} \times \frac{b^3 t^3}{b^2 + t^2}$ If t is very small compared with b, $= \frac{N}{8} \times bt_3$.	$\frac{Ebt^3}{12}$.

The commonest section, next to the circular, is the square; and if the coils are very flat, so that a may be taken as zero—

$$x = \frac{Wlr^2}{\cdot 14058 NS^4}.$$

If the angle a is 45°, the rule becomes—

$$x = \frac{Wlr^2}{2S^4}\left(\frac{7{\cdot}1}{N} + \frac{12}{E}\right).$$

If E be taken as 2½ times N, the rule simplifies to—

$$x = \frac{5{\cdot}9Wlr^2}{NS^4}, \text{ or approximately } \frac{6Wlr^2}{NS^4},$$

whereas if—

$$a = 0,\ x = \frac{7{\cdot}1\ Wlr^2}{NS^4};$$

in other words, whilst the rotation of the ends is greater, the deflection, when the angle is 45°, is only $\frac{6}{7}$ of what it would be if the angle were 0. The maximum stress to which the stuff is subjected by the application of a load W, is, according to the authority quoted below—

$$\frac{4{\cdot}79\ Wr}{S^3}.$$

Making this the proof-stress, we can find the greatest load which should be put upon the spring. If the spring is composed of a broad thin strip the rotation is great for a small axial motion, and Professors Ayrton and Perry use this form of section in their electrical and other measuring instruments, where a small extension of the spring produces a considerable rotation of a pointer attached to it. For the deflection of a volute spring, such as that shown in Fig. 103, due to a given load W, if the stuff is uniform and rectangular in section, the following rule is given by Mr. Young in a paper read at the Institution of Civil Engineers:—*

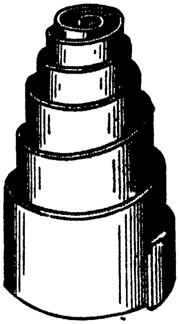

Fig. 103.

$$x = \frac{3\pi W}{2\lambda N b t^3}(R_n^4 - R_o^4),$$

where b and t are the breadth and thickness of the section, λ is the increment of radius per coil, R_n and R_0 being the greatest and least radii of the spiral respectively, and x the required deflection. If the strip varies in thickness, the mean value of t may be taken. If $\lambda = t$, so that the coils just fit (it is usually a little greater to allow for clearance) the rule evidently is—

$$x = \frac{3\pi W}{2Nbt^4}(R_n^4 - R_o^4).$$

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* "Minutes of Proceedings of the Institution of Civil Engineers," Vol. CI., page 265.

The greatest load the spring will bear without getting a permanent set is obtained from the rule—

$$W = \frac{bt^2 f_s}{3R_m}$$

where f_s is the proof or elastic shear stress of the wire or strip of which the spring is made.

The student who wishes to obtain further information on this interesting subject should consult the article quoted.

A flat spiral spring, such as the mainspring of a watch, is everywhere bent, the bending increasing as the spring is wound up. Such a spring does not exert a constant unwinding moment; but this variableness of unwinding tendency may be eliminated or diminished by the introduction of a fusee as in English watches, or by the use of a very long spring and a peculiar method of fastening the ends, as in "going-barrel" watches. If you make an experiment with a spring which is rather short, the coils of which are circular and concentric with the axis of turning, and which is rigidly fixed to the arbour and frame at the ends, you will find that the unwinding couple is nearly proportional to the angle of winding-up, also proportional to the quantity $\frac{Ebt^3}{12}$ (called B on previous page), and inversely proportional to the length of the spring. It is interesting to note the change in the law produced by allowing the ends a certain amount of freedom relative to the arbour. Fig. 104 shows an arrangement which may be adopted, but the writer is in the habit of applying two equal opposite and parallel forces, *i.e.*, a true couple, to the spring. The angle of winding and the couple balancing the unwinding tendency of the spring should be plotted on squared paper. The time of vibration of such a spring is of some importance.

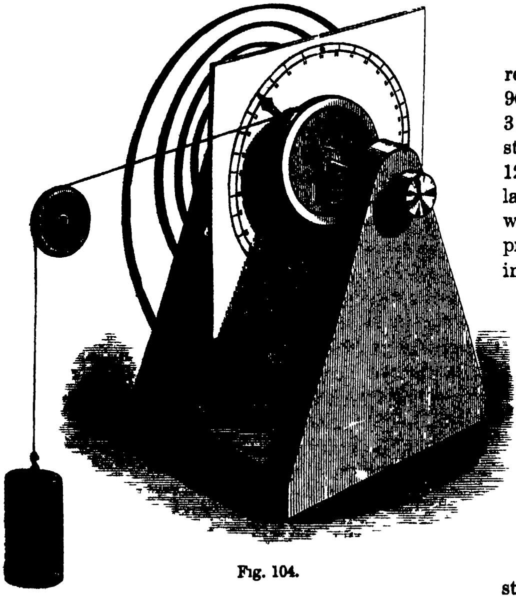

Fig. 104.

The practical application of these various rules can only be properly understood by working numerical examples, and hence the student should go carefully through those which follow.

NUMERICAL EXAMPLES.

1. A cylindric spiral spring of round wire is required, which is to shorten half an inch for a load of 100 lb. If the mean diameter of the coils is 3 inches, and the number of coils 10, find the diameter of the wire, N being 13,000,000. If f_s is 100,000 lb. per square inch, find the greatest load which will not permanently injure the spring. Find also its resilience.

Answers. Diameter of wire = ·426 inch.
Greatest safe load = 1019 lb.
Resilience = 216 ft.-lb.

2. A cylindrical spiral spring of square wire is required, which is to shorten 1 inch under a load of 960 lb. If there are 9 coils in the spring which is 3 inches in mean diameter, find the section of the stuff, the angle of coiling being very small. N = 12,000,000. Taking the same proof-stress as in the last example, find the greatest load which the spring will bear without permanent set. Find also the proper size of section if the angle of coiling is 45°, in which case the length of wire is $\sqrt{2}$ times as great as before. E = 36000000.

Answers. Side of square = ·57 inch.
Maximum load = 2577·5 lb.
If angle of coiling is 45°, S = ·58 inch.

3. A spring similar to the last is required, the coils of which are to close right up with a load of 2,000 lb. If the space between two successive coils, when the spring is unloaded, is equal to the side of the section of the wire, find the proper size of section.

Answer, S = ·49 inch.

4. In a volute buffer spring, the breadth of the strip of which it is composed is 4·5 inches, mean thickness ·3 inch, maximum and minimum radii of the coils, which are supposed just to fit, 2·6 and 1·4 inches respectively. Taking N = 13,000,000 and f_s (the shear stress of permanent set) 100,000 lb. per square inch respectively, find the deflection of the spring with a load of 2 tons, and the greatest load it will probably bear without permanent injury.

Answers. Deflection = 1·865 inches.
Maximum load = 5192·3 lb.

CENTRIPETAL ACCELERATION AND CENTRIFUGAL FORCE.

If I attach a cord to a ball and, holding the former in my hand, whirl the ball round my head in a circle, I am conscious that the ball exerts a pull on my hand by means of the string. We have in this a practical illustration of Newton's law, that a body tends to move on in a *straight line* except when acted on by a force, and if the body is compelled by the force I exert through the string to follow a circular path, it exerts in its turn a force equal and opposite to that with which the string acts on it. One might suppose that the ball tries to fly out radially, but as a matter of fact it tends to proceed on a path *tangential* to the circle.

Let us study the change of velocity—in this case change in *direction* of the motion—or acceleration due to the inward-acting or "centripetal" force. Instead of moving with a regularly changing direction, let the body move along the sides of a polygon, as A B in Fig. 105, moving along A B with a uniform velocity, then suddenly changing its direction of motion to B C. Let S Q and S P (Fig. 106) represent the uniform velocity along A B and B C; then P Q will represent the acceleration or change of velocity at the point B.

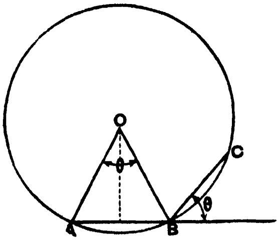

Fig. 105.

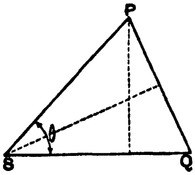

Fig. 106.

But in Figs. 105 and 106 it is easily seen that the triangles P S Q and A O B are similar, hence $\frac{PQ}{SQ} = \frac{AB}{AO}$, or alternately, $\frac{PQ}{AB} = \frac{SQ}{AO}$.
But since P Q is the centripetal acceleration a, and A B is the uniform velocity v;

$$\therefore \frac{PQ}{AB} = \frac{SQ}{AO} \text{ may be written}$$

$$\frac{a}{v} = \frac{v}{r},$$

or—

$$a = \frac{v^2}{r}.$$

We have then the important result, that the centripetal acceleration of the particle or body considered is the *square of its velocity divided by the radius of its path*. Let the number of sides in the polygon be indefinitely increased, and we have in the limit the polygon agreeing with the circle and the body moving with a regularly changing velocity on the circle. Hence the centripetal acceleration of a body, moving uniformly in a circular path, is $\frac{v^2}{r}$. But force = mass × acceleration; hence, if m is the body's mass, centripetal force $= \frac{mv^2}{r}$. What is called the *centrifugal* force, exerted by the *body itself*, is equal and opposite to this, being directed radially *outwards*, but in amount also equal to $\frac{mv^2}{r}$. If ω is the angular velocity in radians per second, since $v = \omega r$, the centrifugal force is $m\omega^2 r$. Engineers sometimes prefer this in terms of number of revolutions per minute. Let n be this number and W the body's weight in pounds.

Then—

$$\omega = \frac{2\pi n}{60},$$

hence—

$$\text{Centrifugal force} = m\left(\frac{2\pi n}{60}\right)^2 r = \frac{4\pi^2}{3600} \times \frac{W}{32 \cdot 2} \times rn^2$$

or—

$$\text{Centrifugal force} = \frac{Wrn^2}{2936},$$

which is a very convenient expression for use in practical questions.

It must be remembered that the radius of the body's path is expressed in feet; the centrifugal force will then be in pounds. The student should also carefully observe that the centrifugal force is not a force *acting on* the revolving ball or body, but is equal and opposite to the centripetal force acting on it, and is in fact a force exerted by the ball itself. The want of accuracy shown by some in this respect has led a few *ultra*-scientific people to object to the excellent and convenient expression "centrifugal force," but it is used unreservedly by the highest authorities. Of course, the centrifugal force is the *resultant* of a great number of forces, just as the "force of gravity" is the resultant of all the forces exerted by gravity on any body.

LOGIC.—III.

[Continued from p. 159.]

SYLLOGISMS: THEIR STRUCTURE, ETC.

HAVING now defined a Syllogism, and mentioned some of the most common erroneous views about syllogistic reasoning, we have next to examine somewhat more closely into its structure, and into the different rules which have been framed to ensure the correctness of all reasoning which is reducible to this form.

At the root of the syllogistic theory lies the fact that every Conclusion is in reality deduced or derived from two other Propositions, called *Premises*, i.e., propositions *premised*. Many persons have been led to deny this, because *both* the premises are not always expressed, one of them indeed being commonly omitted; but in every case it will be found that the admission of the second or suppressed premise is essential to the validity of the conclusion as an inference. This will appear evident from supposing the truth of the suppressed premise to be *denied*, when it will be found that we have no sufficient grounds to warrant our inferring the truth of the conclusion. If, for example, anyone asserts that from the *single* premise, "the world exhibits marks of design," he can draw the conclusion that "the world must have had an intelligent author," his error will be seen if an opponent *denies* that "whatever exhibits marks of design must have had an intelligent author." This will at once make it evident that it is not from *one* premise alone that the conclusion is inferred, but from *two* in combination, whether they are both expressed or not. Any other example of syllogism which might be taken would equally illustrate this. Where, as above, one of the premises is suppressed, the argument is called by logicians an *Enthymeme*, though this is not the correct use of the term.

When a syllogism is stated in correct logical form, the premises are placed first, and the conclusion last; the latter being in all cases that which is to be proved, and the former that by means of which this is proved.

There are several kinds of syllogisms, differing in the kinds of propositions of which they are composed; but we are at present speaking only of the Categorical Syllogism, all three propositions of which are pure categoricals.

Let us take a syllogism of this sort, and examine and analyse it: *e.g.*—

All men are mortals;
Socrates is a man;
Therefore, Socrates is mortal.

Now, upon reflection it will appear evident, in the first place, that the validity of the argument in such a case does not at all depend upon the truth of the premises. Either or both of these might be false or absurd, and yet the argument be quite sound, *i.e.*, the conclusion *follows from* them, so that if they *were* true, it would be true also, and so that it would be impossible for anyone to deny the truth of the conclusion, and yet admit that both of the premises were true. "All men are stones; this bird is a man; therefore, it is a stone," is a syllogism exactly corresponding to the one above given, and its reasoning is perfectly correct. The conclusion follows necessarily from the premises, and when once they are admitted, the conclusion must be admitted also, as necessarily following therefrom, and this although both the premises are really false.

Hence, of course, it is not even necessary, in order that we should be able to determine upon the validity of a syllogism, that we should understand fully the *meaning* of the terms of which its propositions are made up; so that we can just as well represent such a syllogism as the above by means of symbols without any fixed meaning. "All Y is X; Z is Y; therefore, Z is X," will be a correct and valid argument, no matter what X, Y, and Z may be employed to represent.

The rule for testing the validity of syllogisms, laid down by Aristotle (and called the *Dictum de omni et nullo*), is this:—"Whatever is predicated (*i.e.*, affirmed or denied) universally of a term (in other words, of a term distributed), whether affirmatively or negatively, may be predicated in like manner (*i.e.*, affirmed or denied) of everything contained under it." Thus, in the examples we have taken, "mortal" (X) is affirmed universally of the term "men" (Y), *i.e.*, of this term distributed, and "Socrates" (Z) is contained under "men" (Y); therefore "mortal" (X) may be affirmed of "Socrates" (Z). This rule may be applied *immediately* or *ultimately* (as we shall afterwards see) to all arguments; and none can be valid which cannot be proved to be in conformity with it. The whole keystone of reasoning, as explained by Logic, is this very simple principle, so simple that upon that very ground it has been scorned and ridiculed by many. The dictum is not, as some suppose, intended to *prove* that a syllogism is conclusive in its inference, but only to *account* for the fact, that *any* argument which happens to be capable of being thrown into the form of a correct syllogism is valid, while *no* argument can be valid which cannot be thus dealt with. If we attempt to reduce an invalid argument in a regular syllogism, we must, it is true, fail; but then the more nearly it is made to approach in form to the syllogistic, the more easy of detection will be its fallacy, the more clearly we shall be able to perceive that it violates some requirement of the dictum above given.

There are certain general rules applicable to all syllogisms alike, which are founded on these two canons:—*First*, Terms which agree with one and the same third term agree with one another; *Second*, Terms, one of which agrees and the other disagrees with one and the same third term, disagree with one another. These are too self-evident to require, or, in fact, admit of proof, and are consequently classed by Euclid, in another form, amongst the axioms of Geometry. The principal of the general rules deduced from them are these:—

1. In every syllogism there are three terms, and three only. For every syllogism proves some conclusion, in where there are two terms only (usually called *extremes*), and unless these are both (one in each of the two premises) compared with one and the same third term, they cannot be proved either to agree or disagree with one another. The predicate of the conclusion is called the *Major* term; its subject, the *Minor* term; and the third term, with which they are each separately compared, is called the *Middle*.

2. In every syllogism there are three propositions, and three only, viz.:—1, the *Major Premise* (in which the major term is compared with the middle); 2, the *Minor Premise* (in which the minor term is compared with the middle); and 3, the *Conclusion* (in which the minor term is compared with the major).

3. The middle term must not be ambiguous; for in this case, although there may be only one middle term in sound, there will be two in sense, and the extremes not being each compared with one and the same third term, it cannot be pronounced either that they agree or that they disagree with one another. The ambiguity may arise from the middle being an equivocal term used in different senses in the two premises, or from its being undistributed in *both* premises. In the latter case the two extremes may have been compared each with a different part of the signification of the middle; so that in reality there will have been two middle terms instead of one. Hence it is all-important that the middle should be distributed *once*, at least, in the premises; which we now know happens when it is the subject of a universal proposition, or the predicate of a negative. It is, however, sufficient for it to be distributed *once;* because if one extreme has been compared with a *part*, and the other with the *whole* of the middle term, they must have been both compared to the same thing.

4. No extreme may be distributed in the conclusion which was undistributed in the premises. This would be in reality to introduce a fourth term; for it would be to compare a *part* only of the extreme with the middle, and then to compare the *whole* of it in the conclusion with the other extreme: *e.g.*, "All men are mortals; fishes are not men; therefore, fishes are not mortal." Here the major term, though undistributed in its premise, is distributed in the conclusion, and the argument, therefore, is invalid. This is an example of what is called an "*illicit process of the Major*" term; an "*illicit process* of the *Minor*" occurring where the same fault occurs with respect to the *Minor* term.

5. From two negative premises nothing can be inferred. This is obvious; for the middle is then a term with which each extreme disagrees, and not one with which one extreme agrees and the other disagrees: *e.g.*, "Men are not stones; Men are not angels," is a combination of propositions which does not warrant any conclusion at all.

6. If one of the premises be negative, the conclusion will be negative. For the remaining premise is affirmative (by Rule 5); therefore, one of the extremes agree with the middle term, and the other disagrees with it; and therefore the extremes disagree with one another, *i.e.*, the conclusion is negative. It can also be shown, in a similar manner, that one of the premises must be negative if the conclusion is negative.

7. If both premises are particular, nothing can be inferred. In this case one of the premises would be affirmative (by Rule 5); and in it, therefore, both subject and predicate (one of which is the middle) would be undistributed. Hence, the middle to be once distributed (in accordance with Rule 3), would have to be the predicate of the other premise, which would consequently be negative. This (by Rule 6) would make the conclusion negative. The predicate of this (the major term) would then be distributed, although undistributed in its premise (for in the premises the only term which could have been distributed was the middle), and thus there would result a violation of Rule 4.

8. If one of the premises is particular, the conclusion will be particular. It will easily appear on examination that the violation of this rule would, in every case where the premises are otherwise correct, involve an "illicit process of the minor," a fault we have already explained.

The last two rules are sometimes stated together in this form: the conclusion follows the weaker part—the negative being regarded as weaker than the affirmative, and the particular than the universal.

We have next to see in how many different ways three propositions can be combined so as to make a regular and valid syllogism.

The determination or designation of the three propositions of a syllogism in their order, according to their quantity and quality, is called its *Mood*. Now, as there are the four kinds of propositions (A,E,I,O), and there are three in each syllogism, it is obvious that the number of possible moods is sixty-four in all; for any one of the four may be a major premise, each of which may in like manner have four minors. This gives sixteen pairs of premises, each of which may have four conclusions; so that there are altogether sixty-four ways of combining the three propositions.

The majority of these, however, although arithmetically possible, are logically invalid, from violating some of the above rules. For instance, E E A is excluded for having two negative premises, and fifteen other combinations are inadmissible for the same reason. I I A and eleven others have two particular premises; twelve violate Rule 6; eight Rule 8; and four the latter part of Rule 6, having a negative conclusion with two affirmative premises.

By this means fifty-two modes altogether are excluded, as each offending against one at least of the general rules. In addition, one mood, I E O, is inadmissible, as it always involves an "illicit process of the major"; for the major term is distributed in the conclusion, which is negative, but undistributed in the major premise, whether it be its subject or predicate. There remain, then, ultimately only eleven modes which can be used in a legitimate syllogism. These are A A A, A A I, A E E, A E O, A I I, A O O, E A E, E A O, E I O, I A I, and O A O.

The *Figure* of a syllogism is determined by the situation of the middle term with reference to the extremes in the two premises. Hence, there result four figures: inasmuch as the middle term may be the subject of both premises, or the predicate of both, or the subject of either and the predicate of the other. When the middle is the subject of the major premise and the predicate of the minor, the figure is called the *First*. In the *Second* figure the middle is the predicate of both premises; in the *Third*, the subject of both; and in the *Fourth*, the predicate of the major premise and subject of the minor. Thus, let "M" represent the major term, "m" the minor, and "μ" the middle; we may exhibit the four figures thus:—

1.	2.	3.	4.
μ M	M μ	μ M	M μ
m μ	m μ	μ m	μ m
m M	m M	m M	m M.

Out of the eleven modes enumerated above all are not admissible in every figure. Thus A I I, which is legitimate in the first and third figures, would have the middle undistributed in the second and fourth; and A E E would involve an "illicit process of the major" in the first, while it does not violate any rule in the second. By trying the different modes which are legitimate in the different figures, we shall find as the result of the experiment that each figure will admit of but six moods. But of the twenty-four thus allowable, five are *useless* (*e.g.*, A A I in Fig. 1), as having a particular conclusion when the premises are such as to warrant a universal one. There are thus nineteen moods remaining.

Logicians have devised names for each of these nineteen moods to distinguish the figure in which it occurs, and also to serve other purposes we shall subsequently point out. The three *vowels* in each name denote, by their quantity and quality, the three propositions of which the syllogism is composed. The names are these:—

Fig. 1. Barbara, Celarent, Darii, Ferio.
Fig. 2. Cesare, Camestres, Festino, Baroko.
Fig. 8. Darapti, Felapton, Disamis, Datisi, Bokardo, Ferison.
Fig. 4. Bramantip, Camenes, Dimaris, Fesapo, Fresison.

From an examination of these different moods of each figure, we may perceive, amongst other things, that all four conclusions may be proved in the first figure (in which alone A is capable of proof); that the second only proves negatives, and the third particulars; and that any conclusion except A may be established by the fourth figure. These peculiarities follow from the rules already given; thus, since by Rule 6 the middle must be once at least distributed, and that in the second figure it is the predicate of both premises, one of them must be negative, and therefore the conclusion negative also. A little consideration will enable the reader to account for all other special rules of a like nature, *e.g.*, that the minor premise must always be affirmative in the first figure. This may be proved as follows:—If the minor were negative, the conclusion would also be negative (Rule 6), and the major affirmative (Rule 5); hence there would be an "illicit process of the major term," it being in the first figure the predicate of both the major premise and the conclusion. By a similar application of the general rules it can be shown that the minor premise is affirmative in the third figure also; that the major is universal in the first and second, etc. etc.

We may take one mood as an example in each figure of the meaning of the name. "All Y is X (Bar); all Z is Y (ba); therefore, all Z is Y (ra)," is an example of *Barbara*: "All X is Y; no Z is Y; therefore, no Z is X," of *Camestres*: "All Y is X; all Y is Z; therefore, some Z is X," of *Darapti*: and "All X is Y; no Y is Z; therefore, no Z is X," of *Camenes*.

The four moods of the first figure are called perfect, because the dictum is *directly* and immediately applicable to them, and all the others imperfect. In the first the major premise states that the major extreme is predicated of the middle taken distributively; and the minor, that the minor extreme is contained under the middle: so that almost the very words of the dictum can be directly applied.

Now as all reasoning ultimately depends upon the possibility of the dictum being applied as a test of its validity, we must be able to bring all imperfect moods into the form of some one of the moods of the first figure in order to apply this test. The process by which this is done is called *Reduction*, which is the changing of an imperfect mood into a perfect, so as to make the force and validity of the reasoning evident, which was not directly evident before. This is of two kinds—*Ostensive* Reduction and Reduction *ad* (or less properly *per*) *impossibile.*

(1) *Ostensive* Reduction.— By this method we prove in the first figure (which we know to be correct, because we can apply the dictum to it *directly*) either the very same conclusion as that of the original *Reducend* (*i.e.*, the imperfect) mood, or one which directly implies it. Let us take *Darapti* as an example —

Da All wits are dreaded;
rap All wits are admired; therefore,
ti Some who are admired are dreaded.

This is reduced to *Darii* by converting the minor premise (per accidens) :—

Da All wits are dreaded;
ri Some who are admired are wits, therefore,
i Some who are admired are dreaded

Here we have the *same* conclusion in the reducend and reduct moods. Or, suppose we have *Camestres :—*

All X is Y;	We can reduce it to *Celarent*, thus—	No Y is Z;
No Z is Y;		All X is Y;
∴ No Z is X.		∴ No X is Z.

This is done by simply converting the minor and then transposing the premises; and we then get the original conclusion from the new one by converting it simply. And since by applying the test of the dictum we know that the new conclusion is true, being correctly deduced from true premises, we know, by the laws of conversion already explained, that its simple converse, the old conclusion, is true also. Thus, in Ostensive Reduction our mode of proof is always to show *directly* that the conclusion of the reducend is *true.*

(2) In Reduction *ad impossibile*, however, we prove its truth *indirectly* by showing it *cannot be false.* Let us illustrate this by an example. Suppose we are given in *Baroko :—*

All good rulers are loved by their subjects;
Some absolute monarchs are not loved by their subjects;
∴ Some absolute monarchs are not good rulers.

Now, if this conclusion be false, its contradictory must be true (as we have seen before). This is, "all absolute monarchs are good rulers." If we, then, substitute this proposition for the minor of the original syllogism, and draw a new conclusion from these two new premises, we have the following syllogism in *Barbara* :—

All good rulers are loved by their subjects;
All absolute monarchs are good rulers;
∴ All absolute monarchs are loved by their subjects.

This new conclusion is the contradictory of the original minor premise, and therefore must be false; for as the premises are always granted to be true, it is only the validity of the conclusion asserted to be deduced from them which has to be investigated. But the new conclusion having been correctly deduced from two premises in the first figure, the falsehood must be in the *premises.* The major cannot be the false one, because it is one of those originally laid down as true. Hence it is the minor which must be false, and therefore its contradictory must be true; and this is the original conclusion of which we were seeking to prove the truth.

It was with a view to pointing out the manner in which the different moods are thus to be reduced that their names above given have been framed. The initial consonants, B, C, D, F, denote the mood of the first figure (Barbara, Celarent, Darii, or Ferio) to which the reduction is to be made; *s* and *p* signify that the proposition denoted by the vowel immediately preceding is to be converted in the process (*s*, simply, and *p*, per accidens); *m* points out that the premises are to be transposed; and *k*, the sign of reduction *ad impossibile*, indicates that the proposition denoted by the vowel immediately before it is to be omitted, and the contradictory of the conclusion substituted for it—*k*, therefore, occurs only in *Baroko* and *Bokardo*, those being the only moods to which this kind of reduction is usually applied.

BRITISH COMMERCE.—V.

[*Continued from p.* 169.]

TOBACCO.

As a revenue-yielding commodity this is one of the most important articles we import. The total amount gathered by the customs in 1890 was £19,955,187, and of this tobacco contributed nearly the half, or £9,396,517. The high duties borne by this useful weed may be realised from the fact that the 65,729,970 lb. imported in 1890, and of the declared value of £2,092,665, paid a gross duty of £9,012,815, or more than four times the value of the article itself. It is this heavy impost that makes tobacco the chief article with which attempts at smuggling are practised.

Of all kinds of tobacco—manufactured, unmanufactured, cigars, and snuff—the total imports in

1890 were 69,456,729 lb., of the declared value of £3,518,602. By far the greater portion of this came from the United States of America, viz., 55,610,084 lb., of the declared value of £2,530,510. The rates of duty levied on tobacco vary according to the condition in which it comes over. On unmanufactured tobacco the rate is 3s. 2d. per lb. when it contains 10 lb. or more of moisture in every 100 lb., and 3s. 6d. when the moisture is less than 10 lb. in every 100 lb. On cigars the duty is 5s. per lb.; on cavendish or negro-head 4s. 6d. per lb.; on snuff with more than 13 lb. of moisture per cent. 3s. 9d. per lb., and with 13 lb. or less per cent., 4s. 6d. per lb.; and on other kinds of manufactured tobacco 4s. per lb. These varied and heavy duties make the handling of tobacco by the customs officials a matter of great importance and intricacy.

The tobacco-plant, which attains a height of about six feet, is an annual, and the parts that enter into commerce are the leaves. After blooming, the plants are cut close to the ground and hung up on poles to dry. Thereafter the leaves are taken from the stems, sorted into different qualities, and made up into bundles preparatory to fermentation. To induce fermentation, the bundles are simply stacked together on the barn floor, a good deal of watchfulness being necessary to prevent overheating and to get every part uniformly treated. The bundles are next packed—in America usually in barrels—hydraulic pressure being used in the packing. Sometimes the tobacco is further treated by the curer or grower with the view to "improving" it, though this is more frequently left to the manufacturer. In this process numerous articles are applied, such as cognac, lavender, thyme, rose-wood oil, cassia, clove, raisins, vanilla, saltpetre, benzoin, sassafras-wood, etc., and the object is to give the tobacco a particular flavour, to make it burn better, to make it milder, or to improve its colour.

The tobacco leaves as they reach us are very dry and brittle, and, consequently, the manufacturer first subjects them to moisture, otherwise the leaves would all break up in the handling. For this water alone is allowable in England; in other countries different sauces are employed. After the leaves are sufficiently damped, the mid-rib is stripped from them and the halves arranged in sorts—the largest and strongest being destined for cutting and spinning, the best-shaped for the wrappers of cigars, broken pieces for filling cigars, and the ribs themselves for grinding into snuff. In the case of tobacco destined to be made info bird's-eye, the mid-ribs are not taken from the leaves, and it is the presence of the chopped-up ribs that has given this kind of tobacco its name.

The ultimate forms that the tobaccos from different countries are used in are, roughly speaking, cigars for all that comes from Havanna and Manilla; Virginian as cavendish, negro-head, black-twist, returns, shag, and snuff; Kentucky, Missouri, and Ohio as cavendish, brown-twist, bird's-eye, returns, and shag; from Holland and Germany as common cigars, moist snuffs, and smoking mixtures; from Java and Japan as light cigars, mixtures, and light shag; and from Latakia, Turkey, Brazil, etc., as cigarettes, mixtures, imitations, and substitutes.

Amongst adulterants of tobacco used in the making of cigars are beet-root leaves, 1,000 tons of which are said to be dried yearly in Thuringia and palmed off as tobacco; cabbage and chicory leaves are also used on the Continent in the same way. The leaves mentioned, also rhubarb, dock, and burdock leaves, are soaked in tobacco-water. In America, brown-paper, specially prepared and impregnated with the juice squeezed from tobacco-stems and refuse, is used for covering cigars and even for filling them.

PEPPER

occupies the chief place amongst spices in British Commerce. The quantity imported is 29,691,858 lb., of the declared value of £724,968. Of this the British East Indies send 26,707,934 lb. at £662,341, Java coming next with 1,871,327 lb. at £40,010.

The chief peppers known to commerce are black and white. Both are obtained from the same plant, *Piper nigrum*; the white being prepared from the ripe fruit, the black from the full-grown fruit but before it has reached maturity. Different methods of cultivating the plants, which are climbing shrubs, are adopted in different countries; and sometimes they are raised from seed, sometimes from cuttings. They begin to yield in the fourth or fifth year, and, if from seed, continue fruitful for from twelve to fourteen years, if from cuttings, for seven years. The pepper from the latter method of raising is much superior in quality to that obtained from plants grown direct from the seed, and the yield is greater. A single vine yields about 1½ lb. to 2 lb. in a year, and an acre may be set out with 2,500 plants. Thus, each plant yielding 2 lb., the produce of an acre, at 4d. per lb., would exceed £80, while the cost of raising 2,500 plants is said not to exceed £4.

There are two crops of pepper collected every year—the first in December and January, and the second in July and August. The bunches are picked off the vines by hand, and then rubbed or trampled upon to separate the berries from the stems. At this stage the berries are of a bright red colour of the size and appearance of our holly berries. They are next spread out on mats and left for from two to three days to dry in the sun. This process makes the berries black and shrivels them up, giving the pepper the appearance in which we see it. After this it is put into bags of 64 or 128 lb. each, and sent into the market. Unground pepper comes over free from adulterants; in the ground state, however, though a penalty of £100 is attached to its sophistication, it is often mixed with meal, sago, sand, starch, burnt bread-crusts, and similar substances.

White pepper, as already remarked, is the produce of the same plant as the black pepper, the berries being allowed, however, to ripen in the former case. Sometimes it is prepared by removing the dark outer layer of the dried black pepper. More frequently, after being gathered and kept in the house for a few days, it is subjected to washing and bruising, whereby the stalks and pulp are removed, leaving the white seeds, which are ready for the market on being dried. Other peppers are cayenne, which is the produce of several varieties of the *Capsicum*, and long pepper, imported in entire spikes about 1½ inch long.

For a considerable time, pepper was one of the most heavily taxed articles among our imports. Until 1823 the duty was as high as 2s. 6d. per lb.—seven times its price. In 1826, the duty on pepper from British Possessions was reduced to 1s; in 1837, to 6d.; and in 1866 it was repealed.

SPONGES

come into this country to the extent of 1,577,127 lb., of the declared value of £244,198. Turkey is the largest contributor both in bulk and value of this prized product, the principal figures being: Turkey 599,673 lb., worth £98,505; Greece 452,931 lb., worth £80,566; United States 202,467 lb., worth £20,683; France 188,881 lb., worth £23,428; and Malta 48,387 lb., worth £9,678.

Commercially speaking, the term sponge is applied to the elastic horny skeletons of certain animals inhabiting the sea. By far the finest quality of sponges are those that come from the Mediterranean—especially when found in the Levant and off the Syrian and Tripoli coasts. American sponges are coarse, and are found in the neighbourhood of the Bahamas and off the coast of Florida. Among the physical conditions that appear to be necessary to, or at least needful for the encouragement of sponge life, is the presence of currents and a continued supply of aërated water. Hence the reason why they occur so abundantly in archipelagoes and off coasts bordered by islands or long reefs.

In fishing for sponges different methods are adopted, according as they are in deep or shallow water. In shallow water, they may be hooked by harpoons and dragged from their attachments. In deeper water—say from 25 to 40 fathoms—divers go down for them, and in water beyond this depth dredging is resorted to. In harpooning the chief obstacle is to see where the sponges are through the troubled surface of the sea, and, to overcome this, oil is used to make the surface smooth. Sometimes a water-glass is employed instead—consisting of a tube a foot wide and a foot and a half long, with a pane of glass at the lower end. This, being immersed into the water, enables the fisherman to see clearly for a depth of 30 fathoms.

In diving for sponges when they are beyond the reach of the harpoon, the diver takes in his hand a triangular-shaped stone of about 25 lb. in weight with a hole in one corner to which a strong line is attached, whereby communication is maintained with those in the boat. Round his neck is a net to carry the sponges in. The duration of a dive is said to be about two minutes, and at the end of that time the diver pulls the cord and is drawn up—perhaps with a good haul in his net and perhaps with nothing. A good diver, in good condition, will make from eight to ten such descents in a day. The work, however, is severe, and, after working at great depths, the diver often swoons when brought to the top. The boats from which these operations are carried on usually have a crew of eight. The proceeds of the fishing are divided into shares—three shares being allotted to divers for every two shares to rowers.

In dredging for sponges the season of the year chosen along the west coast of Asia Minor is the winter, when the sea-weed and other entangling growths have been dislodged by storms from the bottom. The net is usually about a yard high and six yards wide, and is dragged along by a tow-line attached to a ship.

In preparing sponges for the market they are first exposed to the air, whereby the animal is killed. Immediately the signs of decomposition begin to appear, they are beaten with sticks or trodden on in a stream of flowing water. This is to free the skeleton, or sponge as we know it, from the remains of the animal. They are then hung up in the air to dry, and, when completely dried, are packed up in bales. If packed before thoroughly dry, the sponges heat and suffer—the resulting affection being termed by the fishermen "cholera." It is fatal to the sponge unless it be detected in time, and then the bales have to be unpacked and the affected parts removed.

Being sold by weight, sponges are frequently adulterated with sand. To improve their colour also, they are often bleached, which gives them a very light colour at the expense of their durability.

SUGAR

arrives here in various forms. Of refined sugar the total import in 1890 was 9,976,665 cwt., of the declared value of £8,140,510. This came as lumps and loaves and in other shapes, including candy, and mainly from Germany, France, and Holland—countries that sent respectively 5,002,846 cwt., valued at £4,049,367; 2,701,531 cwt., at £2,185,822; and 1,785,365 cwt., at £1,488,096. Of unrefined sugar the total import was 15,717,476 cwt., of the declared value of £9,935,097, comprising unrefined beet-root, unrefined cane, and other sorts. The unrefined beet-root sugar has its origin in Continental countries, mainly Germany, France, Belgium, and Holland. From Germany came 6,869,440 cwt., valued at £4,200,149; from France 1,378,320 cwt., at £876,158; from Belgium 1,309,689 cwt., at £785,371; and from Holland 403,760 cwt., at £231,382. The leading countries sending us unrefined cane are: Java, 1,377,241 cwt., valued at £979,886; British Guiana, 758,540 cwt., at £597,615; British East Indies, 710,736 cwt., at £367,571; Peru, 607,120 cwt., at £412,246; British West India Islands, 578,978 cwt., at £420,658; Philippine Islands, 566,187 cwt., at £300,688; and Brazil, 430,847 cwt., at £259,369. In addition to the foregoing, we received 563,687 cwt., of the value of £184,416, of molasses and 736,905 cwt., of the value of £446,147, of glucose—the former being chiefly from the United States and the latter from the United States and Germany.

The sugar-cane is a tropical grass with a stem about 2 inches in diameter, and rising to the height of 15 feet. When ripe, the canes are cut down and removed in bundles to the mills to be crushed. The object of the crushing process is to express the juice, which is gathered into vessels and boiled, the canes themselves being used as fuel. About half a dozen pounds of this juice is reckoned to give a pound of raw sugar. After the juice has been boiled to the consistency of syrup, it is removed into other vessels, where, as it cools, it is stirred until it granulates. It is then collected into large casks or hogsheads and drained, the drainings being what is called molasses, the material left in the casks being sugar in the condition in which it is known as muscovado, the moist or brown sugar that we are familiar with. To make this white, all that is required is to further drain it and subject it to a form of washing. This is called claying sugar, because clay is used in the process. Over the sugar, which is placed in pots perforated at the bottom, is placed a layer of clay on which water is poured. The water oozes through the clay, trickles amongst the sugar, and in its progress washes away the molasses from the sugar crystals, leaving them white. The brown colour of what we call moist sugar is thus due to the presence of molasses. Loaf sugar is also a more refined form of muscovado. The latter is boiled, clarified with eggs or bullocks' blood and by filtration through animal charcoal, then clayed in perforated conical moulds, from which, on being removed, it is dried, and is then ready for the market.

Beet-roots are well enough known in this country, and though not cultivated for the production of sugar, yet find their way to our tables in salads. The processes of converting their juice into sugar are in effect pretty much the same as in the case of the cane—separation of the juice and evaporation. Besides cane and beet sugars, others known to commerce, though less extensively, are: sugar from dates; sugar from honey, called also Californian because it is in California that the honey used for this purpose is produced; glucose, obtained mostly from starch and used chiefly in brewing; and saccharin, a product of coal-tar and two hundred times sweeter than cane sugar. Besides these there are a great many other kinds of sugar; for, like alcohol, sugar may be made from almost anything, though the plants that contain it in most profitable quantities are the sugar-cane and the white beet. The variety of its sources may be seen from the following remarks by Mr. P. L. Simmonds:—

"The plants containing sugar, far from being confined to a single species, are extremely numerous. There has been a long list published of them, and sugar may be extracted in greater or less portions from a vast number. If any form of *lignin*, or woody fibre—for instance, sawdust (cleansed from all foreign bodies, such as resin, extractive matter, etc.)—be rubbed up in a little sulphuric acid, taking care that the action of the acid does not go to the extent of charring, and if the acid be afterwards abstracted by adding to the mixture an alkali or some powdered chalk, it will be found that the *wood* has been changed into a species of *gum*. If we now boil this gum for some hours in acidulated water, it gradually becomes converted into sugar.

"Hay, straw, leaves, shavings—in short any form of ligneous fibre—may be similarly converted; and although we do this but clumsily and inconveniently in our laboratories, being as we are but nature's journeymen, nature herself carries on these transmutations with the most wonderful results, as we see in the ripening of fruits, where the hard woody texture gradually softens down into sweet and luscious pulp, as in the ripening of the pear, the grape, the strawberry, and, in short, almost all fruits.

"Braconnot, some years since, pointed out the very remarkable fact that sawdust and linen could be converted into grape-sugar, and that from a pound of these substances more than a pound of sugar could be produced. The process is as follows:—

Wood, or linen, or paper, is left to imbibe its own weight of oil of vitriol; eventually the whole is converted into a viscid mass; care must be taken that it does not become too hot. This mass, being diluted with water, is boiled for some hours, the liquor is filtered, the acid removed by chalk, and the sugar formed after evaporation. One hundred pounds of sawdust will yield by this treatment one hundred and fifteen pounds of sugar; the same quantity of starch may be converted by a similar operation into one hundred and six pounds of saccharine matter."

Iron ships engaged in the sugar trade have to be very carefully looked after. The drainings from the sugar, in cases or in bags, find their way to the bottom of the ship, and have the effect of dissolving the iron. These drainings have to be removed and chemicals applied to counteract the action of the sugar, else the ship's bottom would be ultimately eaten right away. Serious losses are sometimes inflicted upon shippers through the effect of different cargoes upon ships. Thus a ship that sailed outwards with a cargo of creosoted sleepers came back with sugar and coffee. So saturated with creosote was the sugar on arrival, that the consignee refused to take it up. It was consequently thrown upon the hands of the brokers, and they had to have it refined over again ere they could dispose of it. Another example of incompatible cargoes is wine and tea. A fine China clipper was ruined for the tea trade by reason of a consignment of wine it once brought home. This contaminated the ship, so to speak; it had to be overhauled, and is now engaged in the Australian trade. Sometimes one notices an oniony flavour about eggs; this is due to the presence of onions in the same ship that brought the eggs over. So well known is the sensitiveness of eggs in this respect that those from Spain, whence we receive also large quantities of onions, are always stowed in the fore part of the ship.

QUICKSILVER

comes mostly from Spain, which, out of our total import of 4,455,733 lb., of the declared value of £588,761, sent 3,535,088 lb., worth £472,783. Italy comes next with 845,280 lb. at £106,627, and then Austria with 67,500 lb. at £8,475. The best known mines are those of Almaden in Spain and of Idria in Illyria. There are also extensive mines at New Almaden in California, and it occurs abundantly in China and Japan. It is often found native in globules disseminated through its ores; but nearly all that is known to commerce is derived from cinnabar, from which it is extracted by distillation.

The appearance of quicksilver, or mercury, is familiar to everyone from its employment in thermometers. It is specially suited for this on account of the uniform rate at which it expands, when subjected to heat, between wide ranges of temperature. It is remarkable as being the only metal that is fluid at ordinary temperature. At −39° F. it freezes and may be cut with a knife, and at 622° F. it boils and is converted into a colourless vapour. From it is derived the valuable pigment vermilion; it is in constant use in the laboratory, is employed to silver mirrors, and is used extensively in medicine. The nitrate of mercury imparts to certain furs the power of felting.

It comes here in wrought-iron flasks containing between 70 and 80 lb. each. These are filled with ladles and a funnel, and stoppered with screws, a vice being used to make the screw fit perfectly close so that none of this valuable liquid may be lost. It used to arrive in skins of several thicknesses from which the wool had been removed. It has also arrived from some parts in bamboo canes, closed with gum and with a wrappage of linen cemented round.

The importance of having this valuable metal carefully packed was illustrated by a case in which a shipowner sought to recover £200 worth of quicksilver from a ship-cleaning contractor. It is usual to allow ship-cleaners to retain whatever they may find in ships; though valuables are often found, the bulk is usually rubbish that is difficult to get rid of. In the case referred to, however, where a ship had conveyed a consignment of mercury and the screws of the iron flasks had not fitted well, the cleaner's findings were too valuable for the owner to allow him to keep it.

TIMBER

is an important item in our imports, and in 1890 represented a total value of £18,378,245, nearly double the value of our tea imports. Fir alone, mainly from Norway, Sweden, Russia, and North America, amounted to close on 14 millions sterling, leaving about 4½ millions to be accounted for by oak, teak, mahogany, and other furniture and hard woods, and house-frames and cabinet work.

The leading port to receive these vast supplies of timber is London, and the leading part of that port is the Surrey Commercial Docks, the centre of the wood trade of the world. These docks cover an area of nearly 400 acres, comprising ten deep-water docks, six timber ponds, and over 220 acres of piling ground for stowing cargoes. In 1890, the number of timber-laden vessels that entered these docks was 850, more than half being steamers. Not many years ago the timber trade was mainly carried on in sailing vessels. Thus, in 1878, the proportion of steam vessels was only 10½ per cent.; now it is upwards of 70 per cent.

Among the leading timbers of commerce a front place is taken by deal, the produce of the white fir, or Norway spruce. This tree, which attains a height of from 80 to 100 feet, grows extensively in the mountainous districts of Europe, and is especially prevalent in Norway. The form in which it comes over here is mainly as spars or deals. In preparing the deals, which run to 12 feet in length, there are of course odd lengths. These odd lengths, when not shorter than 5 ft. 6 in., go by the name of short ends, and are imported by box-makers and packing-case-makers. Lengths shorter than 5 ft. 6 in. are imported as firewood, and are sold by the fathom, 216 cubic feet going to the fathom. This, though called firewood, is not now used as such, but in the manufacture of small boxes, such as those used for packing starch or confectionery in. The ports that this kind of timber comes from are Christiania, Friedrichstadt, Drontheim, Gothenburg, Riga, and St. Petersburg. This kind of wood is used largely for scaffolding, panelling, masts, and flooring. The deals are sold by the standard, a standard containing 165 cubic feet.

The Northern Pine, also called the Danzig fir, goes with the preceding to make up the chief denizens of the forests of the Scandinavian peninsula and Russia. It is shipped from Stettin, Danzig, Memel, Riga, Archangel, St. Petersburg, and other North Europe ports, in the form of logs, planks 11 inches wide, deals 9 inches wide, and battens 7 inches wide. Its quality varies in the different regions where it grows, the hardest, for instance, coming from the coldest parts. When well seasoned, however, it is considered to be almost as durable as oak. It is used extensively in the making of masts, and, on account of its lightness combined with its stiffness, it is considered the best timber for beams, joists, girders, and rafters.

Teak is a native of different parts of India, of Burmah, and of Ceylon, and is exceedingly expensive. Its wood, by means of the presence of a resinous oil, resists the action of water and the attacks of insects. Besides being thus durable, it is light and strong and easily worked. In carpenters' work requiring strength and durability teak is the wood chosen. It is thus used extensively in ship-building and in the permanent way of railways—in the shape of beams and keys. It has the peculiar quality of protecting iron bolts and preventing the iron from oxidising.

The oak that we import comes from both North Europe and North America. None surpass the British oak in quality, and are used in inferior work—some for wheel-carriages, some for staves, and the best for ship-building.

Acacia occupies extensive tracts in America, where it is also called the locust tree, and grows to a height of 32 feet. When well seasoned it is more durable than the oak, and is used in building, in making posts, stakes, and fences.

The wood of the alder tree, though soft, is of great durability in water and when kept continuously wet. For this reason it has been extensively cultivated in Holland, where it has been highly serviceable for piles and sluices.

Beech is found pretty widely over Europe, and, like the alder, is highly durable when kept in water. This makes it useful for piles and in ship-building. Its hardness also renders it suitable for wooden tram-lines, carriage-panels, and tools.

Cedar is of many different kinds, the commonest kinds being the red cedar and the Havannah cedar. The former is found in Canada and the States, and is used mainly for wardrobes, drawers, and boxes. It is not subject to attacks from insects on account of its smell, which also protects the contents of boxes made of this wood. Bermuda cedar is also used in the making of pencils. The Havannah cedar is native to Honduras, Jamaica, and Cuba, whence it is exported in logs about three or four feet square. It enters mostly into the making of cigar-boxes and the lining of furniture.

Lignum Vitae comes chiefly from Central America and Jamaica. It is noted for its hardness and weight, and, by reason of its cross-grained character, cannot be split with the axe. It arrives here in the form of billets about three feet long and a foot thick. It is used largely by turners in the formation of articles necessitating a hard close-grained wood; but mostly for pulleys of ships' blocks.

A valuable wood to furniture-makers, by reason of its effective appearance, is the bird's-eye maple of North America. This is really a diseased growth, or excrescence, on the maple tree, which grows to a great height, and is one of the most handsome in American forests. Its timber, however, apart from the bird's-eye growth, has no special value. In spring, when the sap begins to flow, it is customary in many parts to tap the maple trees, the juice thus obtained being subsequently boiled and converted into maple sugar. Often in remote settlements this was the source of all the sugar enjoyed by the early Canadian settlers.

Lancewood comes from Cuba and Guiana, arriving here in the form of poles about 20 feet long and 6 inches across. It is used in materials requiring strength and elasticity, such as the shafts of vehicles, and the bows of archers.

GREEK.—XXII.

[*Continued from p.* 175.]

VERBS IN -ω WITH THE PRESENT STEM STRENGTHENED (*continued*).

VIII. *Verbs whose Tenses are formed from different Roots, connected only in signification.*

1. **αἱρέω**, *I take* (*e.g.* a city), fut. **αἱρήσω**, perf. **ᾕρηκα**, 2 aor. **εἷλον**, **ἑλεῖν** (ἙΛ-), aor. pass. **ᾑρέθην**, fut. pass. **αἱρεθήσομαι**; mid. *I choose*, fut. **αἱρήσομαι**, aor. **εἱλόμην**, perf. mid. or pass. **ᾕρημαι**; 3 fut. **ᾑρήσομαι**.

2. **ἔρχομαι**, *I go, I come* (the other moods and the participles are borrowed from **εἶμι**—accordingly **ἔρχομαι**, **ἴω**, **ἴθι**, **ἰέναι**, **ἰών**); imperf. **ἠρχόμην** (commonly **ᾔειν** *or* **ᾖα**); fut. **εἶμι**, *I shall go* (**ἥξω**, *I shall come*); perf. **ἐλήλυθα**, 2 aor. **ἦλθον**, subj. **ἔλθω**, opt. **ἔλθοιμι** (or **ἴοιμι**), imper. **ἔλθε**, inf. **ἐλθεῖν**, part. **ἐλθών**, from root **ΕΛΥΘ-**.

3. **ἐσθίω**, *I eat*, imperf. **ἤσθιον**, fut. **ἔδομαι**, perf. **ἐδήδοκα**; (ΦΑΓ-) 2 aor. **ἔφαγον**, **φαγεῖν**, perf. mid. or pass. **ἐδήδεσμαι**, aor. pass. **ἠδέσθην**.

4. **ὁράω**, *I see, I behold*, imperf. **ἑώρων**, perf. **ἑώρακα**; (ΟΠ-) fut. **ὄψομαι**; mid. or pass. **ὁράομαι**, **ὁρῶμαι**, perf. mid. or pass. **ἑώρᾱμαι** *or* **ὦμμαι**, **ὦψαι**, etc., inf. **ὦφθαι**; (ΙΔ-) 2 aor. **εἶδον**, **ἴδω**, **ἴδοιμι**, **ἴδε**, **ἰδεῖν**, **ἰδών**; 2 perf. **οἶδα**, *I know*; aor. mid. **εἰδόμην**, **ἰδέσθαι**, **ἰδοῦ**, also **ἰδού**, *behold! lo!* (Lat. *ecce!*), aor. pass. **ὤφθην**, **ὀφθῆναι**, fut. **ὀφθήσομαι**.

5. **τρέχω**, *I run*; (ΔΡΑΜ-) fut. **δραμοῦμαι**, 2 aor. **ἔδραμον**, perf. **δεδράμηκα**, perf. pass. in compounds **δεδράμημαι**.

6. **φέρω**, *I bear*, (ΟΙ-) fut. **οἴσω**; (ΕΝΕΓΚ-), 2 aor. **ἤνεγκον** (less often **ἤνεγκα**), **-ες**, **-ε**, opt. **ἐνέγκαιμι**, **-ειε**, and **-οιμι**, **-οι**, inf. **ἐνεγκεῖν**, part. **ἐνεγκών**, imper. **ἔνεγκε**, **-έτω** and **-άτω**, etc., (ΕΝΕΚ-) perf. **ἐνήνοχα**, perf. mid. or pass. **ἐνήνεγμαι** (**-γξαι**, **-γκται** or **ἐνήνεκται**), aor. mid. **ἠνεγκάμην**, **ἐνέγκαι**, **-άσθαι**, **-άμενος**, aor. pass. **ἐνέχθην**, **ἐνεχθῆναι**; fut. **ἐνεχθήσομαι**, less often **οἰσθήσομαι**.

7. **φημί**, *I say*, imperf. **ἔφην**, (ΕΠ-) 2 aor. **εἶπον** (more seldom **εἶπα**), **εἴπω**, **εἴποιμι**, **εἶπε**, **-έτω** and **-άτω**, **-ετον** and **-ατον**, **-έτων** and **-άτων**, **-ατε** (comp. **πρόσειπε**), **εἰπεῖν**, **εἰπών**; from the epic pres. **εἴρω**, fut. **ἐρῶ**, perf. **εἴρηκα**, perf. mid. or pass. **εἴρημαι**, 3 fut. **εἰρήσομαι**. From **ΡΕ-**, aor pass. **ἐρρήθην**, **ῥηθῆναι**, **ῥηθείς**, fut. pass. **ῥηθήσομαι**. Middle (only in compounds), fut. **ἀπεροῦμαι**, and 1 aor. **ἀπείπασθαι**, *to doubt, to deny*, as **ἀπειπεῖν**.

EXERCISE 123.

Translate into English :—

1. **Καὶ βραδὺς εὔβουλος εἷλε ταχὺν ἄνδρα διώκων.** 2. **Οἱ Ἀθηναῖοι Θεμιστοκλέα στρατηγὸν εἵλοντο ἐν τῷ Περσικῷ πολέμῳ.** 3. **Ὀδυσσεὺς πρὸς τὸ μέγα δῶμα Ἀΐδου ἦλθεν.** 4. **Ἣν ἂν μοῖραν ἔλῃς, ταύτην φέρε καὶ μὴ ἀγανάκτει.** 5. **Μὴ πίστευε τάχιστα, πρὶν ἀτρεκέως πέρας ὄψῃ.** 6. **Μὴ τοῦτο βλέψῃς, εἰ νεώτερος λέγω, ἀλλ' εἰ φρονούντων τοὺς λόγους ἀνδρῶν ἐρῶ.** 7. **Πένθει μετρίως τοὺς ἀποθανόντας φίλους, οὐ γὰρ τεθνήκασιν, ἀλλὰ τὴν αὐτὴν ὅδον, ἣν πᾶσιν ἐλθεῖν ἐστιν ἀνάγκη, προεληλύθᾱσιν.**

EXERCISE 124.

Translate into Greek :—

1. The Athenians took many soldiers. 2. The city chose Epaminondas general. 3. Themistocles was chosen general by the Athenians. 4. Come, O friend. 5. O dear friends, come hither. 6. If thou art hungry, thou wilt eat with pleasure. 7. The boy has eaten all he had.

VERBS IN -MI.

We now pass on to the second great class of verbs—the verbs in *-μι*, as they are called. The chief peculiarity of these verbs is that in the present, the imperfect, and in some cases in the second aorist active and middle also, take special person-endings different from those of the conjugation in *-ω*, and in the indicative of the other tenses want the mood-vowel. The formation of all the other tenses, with a few exceptions, coincides with the formation of the verbs in *-ω*.

Several verbs in *-μι* which have a monosyllabic stem take in the present and imperfect a reduplication—*i.e.*, when the stem begins with a single consonant or a mute and a liquid, the first consonant of the stem is repeated with *ι*; or if the stem begins with *στ*, *πτ*, or an aspirated vowel, an aspirated *ι* precedes the stem: as—

ΔΟ-	**δί-δω-μι**, *I give.*	ΧΡΑ-	**κί-χρη-μι**, *I lend.*
ΣΤΑ-	**ἵ-στη-μι**, *I place.*	Ἑ-	**ἵ-η-μι**, *I send.*

DIVISION OF VERBS IN -*μι*.

The verbs in *-μι* are divided into two chief classes :—

(1) Such as append the person-endings immediately to the stem-vowels. The stem of this class ends—

in *α*,	as **ἵ-στη-μι**, *I place;*	stem	ΣΤΑ-.
„ *ε*,	„ **τί-θη-μι**, *I set;*	„	ΘΕ-.
„ *ο*,	„ **δί-δω-μι**, *I give;*	„	ΔΟ-.
„ *ι*,	„ **εἶ-μι**, *I shall go;*	„	Ι-.

(2) Those to whose stem the syllable *νν̄υ* or *ν̄υ* is

appended, and which receive the person-endings at the end of this syllable. The stem of the verbs of this class ends—

(*a*) In one of the three vowels α, ε, ο, and takes ννῠ: as—

α- σκεδά-ννυ-μι, *I scatter ;* stem ΣΚΕΔΑ-.
ε- κορέ-ννυ-μι, *I satisfy ;* „ ΚΟΡΕ-.
ο- στρώ-ννυ-μι, *I spread out* (*strew*) *;* „ ΣΤΡΟ-.

(*b*) In a consonant, and takes νῠ:—

In a mute, as δείκ-νῡ-μι, *I show ;* stem ΔΕΙΚ-.
In a liquid, as ὄμ-νῡ-μι, *I swear ;* „ ΟΜ-.

Of this second class, only the verb σβέ-ννῡ-μι (ΣΒΕ-), *I extinguish*, forms the second aorist.

(1) THE FIRST CLASS OF THE VERBS IN -μι.

In the active, the following are the terminations which mark the persons:—

(1) *Person-endings of the Indicative Present.*

Sing.	1.	-μι	as	ἵ-στη-μι.
	2.	-ς	„	ἵ-στη-ς.
	3.	-σι(ν)	„	ἵ-στη-σι.
Dual.	2.	-τον	„	ἵ-στᾰ-τον.
	3.	-τον	„	ἵ-στᾰ-τον.
Plur.	1.	-μεν	„	ἵ-στᾰ-μεν.
	2.	-τε	„	ἵ-στᾰ-τε.
	3.	[-ντι, νσι(ν)]	„	[ἵ-στᾰ-ντι, ἵ-στᾰ-νσι(ν)].

The termination of the third person plural, -νσι, was changed into -ᾱσι, and then contracted with the foregoing stem-vowel of the verb. The Attic dialect, however, admits the contraction only in the stems which end in α; thus, while from ἵ-στα-νσι was formed ἱ-στᾶσι—

τί-θε-νσι became τί-θεισι ; Attic τι-θέ-ᾱσι.
δί-δο-νσι „ δί-δουσι ; „ δι-δό-ᾱσι.
δείκ-νυ-νσι „ δείκ-νυσι ; „ δεικ-νύ-ᾱσι.

(2) *Person-endings of the Indicative Imperfect and Second Aorist.*

Sing.	1.	-ν.	Imperf.	ἵ-στη-ν	ἐ-τί-θην.
	2.	-ς.		ἵ-στη-ς	ἐ-τί-θης.
	3.	—		ἵ-στη	ἐ-τί-θη.
Dual.	2.	-τον.	2 Aor.	ἔ-στη-τον	ἔ-θε-τον.
	3.	-την.		ἐ-στή-την	ἐ-θέ-την.
Plur.	1.	-μεν.		ἔ-στη-μεν	ἔ-θε-μεν.
	2.	-τε.		ἔ-στη-τε	ἔ-θε-τε.
	3.	-σαν.		ἔ-στη-σαν	ἔ-θε-σαν.

In the dual and plural of the optative imperfect the η is commonly dropped, and the termination of the third person plural, -ησαν, is usually shortened into -εν: as—

τιθεί-ημεν = τιθεῖμεν. ἱσταί-ητε = ἱσταῖτε.
τιθεί-ησαν = τιθεῖεν. διδοί-ησαν = διδοῖεν.

In the optative second aorist of the verbs ἵστημι, τίθημι, δίδωμι, on the contrary, the shortened forms are very rare, except the third person plural.

Person-endings of the Imperative Present and Second Aorist.

S.	2.	-θι.	(ἵ-στα-θι)	(τί-θε-τι)	(δί-δο-θι).
	3.	-τω.	ἱ-στά-τω	τι-θέ-τω	δι-δό-τω.
D.	2.	-τον.	ἵ-στα-τον	τί-θε-τον	δί-δο-τον.
	3.	-των.	ἱ-στά-των	τι-θέ-των	δι-δό-των.
P.	2.	-τε.	ἵ-στα-τε	τί-θε-τε	δί-δο-τε.
	3.	-τωσαν.	ἱ-στά-τωσαν	τι-θέ-τωσαν	δι-δό-τωσαν.
			or ἱ-στά-ντων	τι-θέ-ντων	δι-δό-ντων.

The second person singular imperative present throws away the ending -θι, and in compensation the short characteristic vowel is lengthened—that is, α is changed into η, ε into ει, ο into ου, and ῠ into ῡ: thus—

ἵ-στα-θι becomes ἵ-στη.
δί-δο-θι „ δί-δου.
τί-θε-τι „ τί-θει.
δείκ-νῠ-θι „ δείκ-νῡ.

The ending -θι in the present is preserved in only very few verbs. In the second aorist of τίθημι, ἵημι, and δίδωμι, the ending -θι has been softened into σ: thus, θέ-τι becomes θές; ἕ-θι = ἕς, δό-θι = δός. In the second aorist of ἵστημι, however, the termination -θι remains: thus, στῆ-θι.

The termination of the infinitive in the present and second aorist is -ναι. This syllable is in the present added to the short characteristic vowel, but in the second aorist is lengthened, as α into η, ε into ει, and ο into ου.

Present.	ἱ-στά-ναι.	τι-θέ-ναι.	δι-δό-ναι.	δεικ-νύ-ναι.
2 Aor.	στῆ-ναι.	θεῖ-ναι.	δοῦ-ναι.	

The terminations of the participle in the present and second aorist are -ντς, -ντσα, and -ντ, which unite with the characteristic vowel according to the ordinary rules:—

ἱ-στα-ντς = ἱ-στάς, ἱ-στᾶσα, ἱ-στάν. στάς, στᾶσα, στάν.
τι-θε-ντς = τι-θείς, τι-θεῖσα, τι-θέν. θείς, θεῖσα, θέν.
δι-δο-ντς = διδούς, -οῦσα, -όν. δούς, δοῦσα, δόν.
δεικ-νυ-ντς = δεικ-νύς, -ῦσα, -ύν.

The person-endings of the middle voice coincide with those of the verbs in -ω, only that in the second person singular indicative and imperative of the present and imperfect they retain -σαι and -σο in their full forms (yet ἐπίστω, ἠπίστω; δύνω, ἠδύνω; πρίω, ἐπρίω, are the regular forms of good prose).

FORMATION OF THE TENSES.

In the tense-formation of the entire active, as well as of the middle future and first aorist, the short characteristic vowel is lengthened—*α* into *η*, *ε* into *η* and into *ει* (in the perfect active of *τίθημι* and *ἵημι*), also *ο* into *ω*; but is retained in the other tenses of the middle and in all the tenses of the passive excepting the perfect and pluperfect of *τίθημι* and *ἵημι*, which receive the *ει* of the perfect active (*τέθεικα, τέθειμαι*; *εἷκα, εἷμαι*).

The first aorist active and middle of *τίθημι, ἵημι*, and *δίδωμι* have for their tense-characteristic not *σ* but *κ*:—

ἔ-θη-κ-α, ἧ-κ-α, ἔ-δω-κ-α.

The forms of the first aorist active (*ἔθηκα, ἧκα*, and *ἔδωκα*), however, are used only in the indicative, and especially in the singular; in the other persons commonly, and always in the other moods and the participle, the forms of the second aorist are employed. So instead of the forms of the first aorist middle of *τίθημι, ἵημι*, and *δίδωμι*, those of the second aorist middle are used. On the contrary, the indicative forms of the singular second aorist of *τίθημι, ἵημι*, and *δίδωμι* (*ἔθ-ην, ἧν*, and *ἔδων*) are not to be employed.

The verb *ἵστημι* forms the first aorist active and middle like the verbs in *-ω*, with the tense-characteristic *σ*, as *ἔ-στη-σ-α, ἐ-στη-σ-άμην*. The second aorist middle *ἐστάμην* is never used. Some other verbs, however, have the form, as *ἐπτάμην, ἐπριάμην*.

The second aorist passive and the second future passive are wanting in these verbs; also the third future, except in *ἵστημι*—*ἑστήξω*, or *ἑστήξομαι*.

In regard to the signification of *ἵστημι*, observe that the present, imperfect, future, and first aorist active have the transitive import of *to place*. The second aorist, the perfect, and the pluperfect active, and the third future, on the contrary, have a reflex or intransitive meaning—*to place oneself*, or *to stand*.

(2) THE SECOND CLASS OF THE VERBS IN *-μι*.

The tense-formation of the second class of the verbs in *-μι* presents no difficulty. After cutting off the termination *-ννυμι* and *-νυμι*, add the tense-forms to the stem. The verbs in *-ο* which lengthen this *ο* into *ω* in the present, retain the *ω* in all the tenses, as *στρώ-ννῠ-μι, ῥώ-ννῡ-μι, ἑώ-ννῡ-μι, χώ-ννῡ-μι*; future *στρώ-σω, ῥώ-σω, ἑώ-σω, χώ-σω*, and so on.

But the verbs whose stem ends in a liquid take for the formation of some tenses a theme ending in a vowel, as *ὄμ-νῡ-μι*, aorist *ὤμ-ο-σα*, from the theme ΟΜΟΩ. The second aorist and second future passive are found in only a few verbs, as *ζεύγ-νυ-μι*, 2 aor. pass. *ἐζύγην*, 2 fut. pass. *ζῠγήσομαι*.

Remarks on the Models.

In the dual and plural of the indicative, and in the other moods and the participle, for the first aorist active, the second aorist active is used.

Instead of the forms *ἐ-θη-κά-μην, ἐ-δω-κά-μην*, first aorist indicative middle, the Attic forms are used.

The perfect and pluperfect, *ἕστηκα, ἑστήκη* (but not *εἱστήκη*), form the dual and the plural immediately from the stem, as perf. *ἕ-στᾰ-τον, ἕ-στᾰ-μεν, ἕ-στᾰ-τε, ἑ-στᾶ-σι(ν)*; pluperf. *ἕ-στᾰ-τον, ἑ-στά-την, ἕ-στᾰ-μεν, ἕ-στᾰ-τε, ἕ-στᾰ-σαν*; instead of *ἑστηκέναι, ἑστάναι* is usually employed. The participle runs *ἑστώς, -ῶσα, -ός*, gen. *-ῶτος, -ώσης*, as well as *ἑστηκώς, -υῖα, -ός*, gen. *-ότος, -υίας*. With *ἕστατον* compare *τέτλαμεν* (ΤΛΑ-), and *τέθναμεν, τέθνατε, τεθνᾶσι(ν)*, inf. *τεθνάναι*, from *τέθνηκα, θνήσκω* (ΘΝΑ-).

KEY TO EXERCISES.

Ex. 113.—1. The expedition will sail to-morrow. 2. A north wind blew against the expedition. 3. In the sea-fight in the Crisean gulf the Peloponnesians slew as many of the Athenians as did not escape them by swimming. 4. When the enemy approach the city, the soldiers will snatch up their arms and run to the gates. 5. Human affairs have often been bewailed by many wise men who thought that life was a state of punishment. 6. Who would not weep for a friend in misfortune? 7. The citizens hoped that they would escape the enemy. 8. The children will play at ball. 9. Our age has now disturbed faith. 10. The enemy put to confusion the ranks of the Greeks.

Ex 114.—1 Ἡ στρατία ἐξέπλευσεν. 2. Ἡ στρατία ἐκπλευσεῖται. 3. Ὁ ἄνεμος Βόῤῥας ἐνάντιος τῇ στρατίᾳ πνεῖ. 4. Πάντες οἱ ἄνεμοι ἐνάντιοι τῇ στρατιᾳ ἔπνευσαν. 5. Οἱ στρατιῶται ἤλπισαν θεύσεσθαι πρὸς τὰς πύλας. 6. Τοὺς ἀτυχεῖς κλαίεις. 7. Τοὺς ἀτυχεῖς κλαύσεις. 8. Οἱ πολέμιοι φευξοῦνται. 9. Παισὶν ὁμιλῶν παιξεῖ. 10. Ἀγαθοὶ παίζουσιν ἅμα σπουδάζοντες. 11. Οἱ πολέμιοι τὰς τῶν στρατιωτῶν τάξεις συγχεύσουσιν. 12. Ἡ πόλις ὑπὸ τῶν πολεμίων κατακέκαυται. 13. Οἱ στρατιῶται ἡγοῦνται τοὺς πολεμίους τὴν πόλιν κατακαύσειν.

Ex. 115.—1. Many evil things have befallen the soldiers in the expedition 2. By associating with wise men thou thyself also shalt turn out wise. 3 Lycurgus banished costliness from Sparta. 4. Many who have drunk together once become friends. 5. The drunkard is the slave of drink (lit. *of having drunk*). 6. I will not drink up the wine. 7. May the gods punish the evildoers. 8. The citizens outstripped the enemy in their flight to the city. 9. The hare was bitten by the dog 10. You will not arrive at the summit without toil. 11. The women put on beautiful garments. 12. The wine was drunk up by the soldiers. 13. The friend promised to come to me.

Ex. 116.—1. Ἡ γυνὴ ἠμπέσχετο καλὰ ἱμάτια. 2. Ἡ γυνὴ ἀμφέξεται καλὰ ἱμάτια. 3. Οἱ φίλοι ὑπέσχοντο ἀφίξεσθαι. 4. Ὁ στρατηγὸς τοὺς πολεμίους ἔφθασεν εἰς τὴν πόλιν ἐλθών. 5. Οἱ θεοὶ τοὺς κακούργους ἀποτίνουσιν. 6. Πολλοὶ φίλοι συνέπινον. 7. Φίλοι συμπίνοντες ἐχθροὶ γίγνονται. 8. Πολλὰ κακὰ τοῖς ἐμοῖς παισὶ συνέβη ἐνθάδε ἐρχομένοις. 9. Τὸν κακοῦργον ἐκεῖνον Ἀπόλλων ἀποτίσαι.

Ex. 117.—1. Let not the evil man think that he will escape notice for ever. 2. If you have done justly, you will have God as your ally. 3. It is right to learn letters, and, having learnt, to have wisdom. 4. The king did not perceive the plot against himself. 5. The Persians were hateful to the Greeks. 6. Philip himself used to declare that he had increased his own realm more by the aid of gold than arms. 7. The soldiers slept a short time. 8. Directly the horses smelt the camels they fled away. 9. Do not think that you have been forgotten if you have forsworn yourself to God. 10. It is good not to err against one's friends. 11. He is happy who has gained a noble friend.

Ex. 118.—1. Ὁ βασιλεὺς τῆς πρὸς ἑαυτὸν ἐπιβούλης αἰσθάνεται. 2. Τίς οὐχ ἡμάρτηκεν; 3. Οὐκ ἔστι σοφῶν δὶς ἐν τῷ αὐτῷ ἁμαρτάνειν. 4. Ὁ πονηρὸς τοῖς ἀγαθοῖς ἀπεχθάνεται. 5. Πονηρὸς ὢν οὐ λήσεις διὰ τέλους. 6. Οἱ ἄδελφοι μαθόντες νοῦν ἔχουσιν. 7. Οἱ ἀγαθοὶ ἀγαθῶν τεύξονται. 8. Οἱ ἄνδρες κατέδαρθον. 9. Βραχὺν χρόνον κατέδαρθον. 10 Γενναίων φιλῶν τετύχηκα. 11. Μανθάνω ἀτυχίαν φέρειν. 12. Κακὸν ἔργον πράττων ἔλαθεν. 13. Ἐλπίζουσι λήσειν πονηροὶ ὄντες.

Ex. 119.—1. You will find few men who are faithful companions in trouble. 2. It is fated for all men to die. 3. We bewail the dead. 4. Men remember with pleasure ancient deeds. 5. You cannot find a man who is completely (*in every respect*) happy. 6. The noble man wishes to live honourably or die honourably. 7. If you have suffered terrible things through your wickedness, do not at all attribute to the gods what thus befalls you (lit. *your fate of these things*). 8. If any one who is old prays for life, he deserves to live on into many decades of years.

Ex. 120.—1. Οὐδένα ἑταῖρον πιστὸν ἐν χαλεποῖς πράγμασιν εὕρηκα. 2. Σοὶ μόρσιμόν ἐστιν ἀποθανεῖν. 3. Πενθῶ τὸν ἐμὸν πατέρα τὸν τεθνηκότα. 4. Πενθήσουσιν τὸν στρατηγὸν τὸν τεθνηκότα. 5. Ἡδέως τῶν πάλαι γενναίων μέμνημαι. 6. Οὐδένα πάντα ὀλβιώτατον εὗρον. 7. Βούλομαι ἢ καλῶς ζῆν ἢ καλῶς τεθνηκέναι. 8. Πολλὰ πείσει διὰ τὸν σὸν ἑταῖρον. 9. Δύνατόν ἐστι πολλὰ ἐξευρίσκειν, ἀλλ' οὐ πάντα. 10. Οὐδὲ οἱ σοφοὶ βίον ἄλυπον ἐξευρήκεσαν.

Ex. 121.—1. The soldiers will defend themselves against the enemy. 2. Do not be vexed when blamed for your faults. 3. The shepherd will feed the flock of goats on the mountains. 4. The soldiers wished to march against the enemy. 5. The soldiers will be in want of provisions in the enemy's country. 6. He is not the rich man who has much, but he who wants little. 7. Pollux did not wish to be even a god by himself, but preferred rather to be a demigod with his brother. 8. The barbarians being pursued by the Greeks were driven into the river.

Ex. 122.—1. Ἡ λεία ἐνεμήθη. 2 Νεμῶ τὴν λείαν. 3. Ἡ πόλις τιμωρήσει τοὺς πολεμίους. 4. Ὦ παῖ, μὴ ἀχθέσθητι ὑπὲρ ὧν ἥμαρτες ἐλεγχόμενος. 5. Ἀγαθοὶ παῖδες οὐκ ἄχθονται ὑπὲρ ὧν ἡμάρτανον ἐλεγχόμενοι. 6. Στρατεύσομαι ἐπὶ τὰς Ἀθήνας. 7. Ὄζουσι μύρων. 8. Ἡ ψυχὴ εἰς οὔρανον ἀναπτήσεται. 9. Ἀγαθοὶ ἐπ' ἀγαθῷ χαίρουσιν. 10. Τοῖς στρατιώταις ἐπιτηδείων δεῖ. 11. Ἀγαθὸς τῶν παίδων ἐπιμελήσεται, ἀγαθοὶ δὲ παῖδες τῶν τοκέων ἐπιμελήσονται.

TERMS USED IN COMMERCE.—I.

Abandonment.—In marine insurance, the act of relinquishing to the insurer all interest in a damaged ship or cargo, in order to claim for the entire amount insured.

Abbreviations.—The customary contractions are:—

@	at.	*Inst.*	Instant—present month.
A/c.	Account.	*Int.*	Interest.
A.D.	Anno Domini.	*Inv.*	Invoice.
A.M.	Ante meridiem—before noon.	*Jl.*	Journal.
amt.	amount.	*L/C.*	Letter of Credit.
Amt. brot. forwd.	Amount brought forward.	*£ s. d.*	Pounds, shillings, pence.
Amt. carrd. forwd.	Amount carried forward.	*Led.*	Ledger.
A.P.	Last Year.	*Messrs.*	Messieurs—gentlemen.
Bco.	Banco.	*Mdse.*	Merchandise.
Bk.	Bank.	*m/d.*	months after date.
B/L	Bill of Lading.	*m/m*	made merchantable.
B/P.	Bill payable.	*mo.*	month.
B/R.	Bill receivable.	*m/s.*	months after sight.
C.B.	Cash Book.	M.S.	Manuscript.
Commn	Commission.	*N.B.*	Nota bene—Mark well.
Co.	Company.	*N.B.*	North Britain.
Cr.	Creditor.	*O/ac.*	Old Account.
cwt. qrs. lb.	hundredweight, quarters, pounds.	*o/a.*	on account of.
Cy.	Currency.	%	per cent.
D.B.	Day Book.	*oz, dwts., grs.*	ounces, pennyweights, grains.
d/d.	days after date.	℘	per.
Dis.	Discount.	*P/c.*	Price Current.
doz.	dozen.	*p/c.*	per cent.
dft.	draft.	*p m.*	post meridiem—after noon.
Dr.	Debtor.	*Prm.*	Premium.
d/s.	days after sight.	*Prox.*	Proximo—next month.
E.E.	Errors excepted.	*Ult.*	Ultimo—last month.
E. & O.E.	Errors and omissions excepted.	*viz.*	namely.
Ex.	Exchange.		
Exd.	Examined.		
fo.	folio.		
F.O.B.	Free on board		
F.P.A.	Free of particular average.		

Abstract.—An abridgment or epitome of an entire deed, document, or book.

Accepting a Bill.—The writing, by the person on whom it is drawn (called the Acceptor), of his name across the Bill. By this he undertakes to pay it when due.

Accommodation Bill.—A bill of exchange accepted by an individual for the convenience of the drawer or indorser, with whom it rests to take it up at maturity.

Account (*A/c.*).—A statement of the sums due by one person to another, either for goods, or originating out of any mutual transactions.

Account Current.—A statement of transactions between two or more parties during a certain period, drawn out in the order of their dates, and in Dr. and Cr. form.

Account Sales.—An account rendered to a merchant by his agent, showing the weights or quantities of each parcel of goods sold, with the prices obtained, and the net result after deducting all expenses attending the sale.

ACCOUNTANT.—A person skilled in accounts. The official in charge of the accounts of a business is termed an accountant.

ACQUITTANCE. — A discharge in writing for money, debt, or liability.

ACTUARY.—The officer of an Assurance Company, whose duty it is to make the computations required in the business, and to advise on all questions pertaining to the statistics and finance of assurance. Also applied to similar officers in other businesses.

ADJUSTMENT.—In marine insurance, the settlement of a loss incurred by the insured.

ADJUSTMENT OF AN ACCOUNT.—Agreeing or settling the particulars.

AD VALOREM DUTY.—Duty levied on the value and not on the quantity or weight of articles.

ADVANCE.—Money paid on account of goods to be delivered or work to be done.

ADVENTURE.—A speculation.

ADVICE—ADVICES.—Information by letter; commercial reports and intelligence conveyed by letter.

AFFIDAVIT.—A declaration in writing upon oath.

AGENDA.—A memorandum book.

AGENT.—A person authorised to transact business for another, who is called the *principal.*

AGIO.—The difference between the real and nominal value of money, or of paper currency and specie.

ANNUITY.—A periodical or yearly payment.

ANNUITIES.—(*Certain—Deferred—Contingent—Reversionary.*)—*Annuities Certain* are annual payments for fixed terms of years, commencing immediately. *Deferred Annuities* are annual payments for fixed terms of years, commencing at the expiration of a period agreed upon. If either of these two descriptions of annuities depends upon the existence of one or more lives, they are termed *Life Annuities. Contingent Annuities* are payable only in the event of some contingency happening, as the death of a person: they are also termed *Reversionary Annuities.*

APPRAISE.—To set a price upon, or to make an estimate of the value of anything. The *act of appraising* is known as making an APPRAISEMENT, and the person doing so is called an APPRAISER.

ARBITRATION. — The adjustment of disputed matters by the decision of one or more neutral persons (who are called ARBITRATORS), chosen by consent of those concerned.

ARBITRATION OF EXCHANGES.—A computation of the proportional rate between two places, through intermediate places, for the purpose of ascertaining whether direct or indirect drafts and remittances are the most advantageous. When one intermediate place only is concerned, it is termed *simple* arbitration; when more, *compound* arbitration.

ARTICLES OF ASSOCIATION.—A deed containing the terms of agreement made by a number of persons forming a trading firm or joining in a speculation.

ASSETS.—A general term for cash, property, and dependencies, in contradistinction to liabilities.

ASSIGNEE.—One to whom an assignment is made.

ASSIGNMENT.—The act of appointing another to exercise control over certain property.

ASSURANCE (LIFE).—A system by which public companies engage to pay to the person contracting with them a certain sum at the death of a nominee, in consideration of certain cash payments called *premiums,* agreed upon by the parties concerned. (See *Insurance.*)

ATTACHMENT.—A notice prohibiting the sale or disposal of the goods of any debtor in the hands of a third party, until notice shall have been given of the settlement of all claims against the owner. (See *Garnishment.*)

ATTORNEY (POWER OF).—A document granting to others the power to sign and act for the granter either in special cases or unreservedly. (See *Procuration.*)

ATTORNEY (WARRANT OF).—See *Warrant of Attorney.*

AUCTION.—A public sale of property to the highest bidder.

AUDIT. — An examination of accounts and vouchers by authorised persons known as AUDITORS.

AVERAGE.—(*General—Particular.*)—In marine insurance *General Average* is a proportionate contribution levied on the owners or insurers of a ship or its cargo according to value, when part of the cargo or ship has been sacrificed for the preservation of the remainder. *Particular Average* is so called in contradistinction to *General Average.* In this case the loss is totally borne by the owner or insurer.

AVERAGE-STATER.—A person employed by the insured to prepare statements of averages preparatory to their adjustment with the insurers. These statements, which are paid for by the insurers, are often of an intricate character.

AWARD.—The decision in a case of arbitration.

BACKWARDATION. — A consideration paid to purchasers for an extension of time by speculators on the Stock Exchange unable to supply the stock or shares they have contracted to deliver.

BAIL.—To release a person or goods on receipt of security for their reappearance. The person giving the security is termed a BAILEE, and the document he signs is called a BAIL-BOND.

Bailment.—A delivery of goods in trust, on the understanding that they shall be re-delivered as soon as the time or purpose for which they were bailed shall have elapsed or been accomplished.

Balance.—In accounts, the difference required to equalise both Dr. and Cr. sides.

Balance of Trade.—The difference in value between the aggregate amount of a country's exports and imports.

Balance Sheet.—A statement of the assets and liabilities of any trading concern.

Bale.—A pack or parcel of merchandise bound up in a wrapper of paper, canvas, or any similar stuff.

Banco.—A Continental term for bank money, which frequently differs from the current money.

Bank —(*Private—Joint-Stock.*)—An establishment for the custody and issue of money. *Private Banks* are composed of one or more influential men with large capital, whose fortunes and positions in society are security for the sums placed in their care. *Joint-Stock Banks* are composed of numerous members, who together contribute a large amount of capital for the conduct of a banking business. Unless his liability be limited by the charter or deed of association under which the company is organised, the entire fortune of each member is security to the depositor. (See also *Banker.*)

Bank Bill.—A promissory note or bill of exchange issued by a bank, and payable at some future date.

Bank Charter.—A charter of incorporation granted to the Corporation of the Bank of England. The first was granted to Mr. William Paterson (the projector of the Bank of England), on the 27th of July, 1694, for three years, and this has been renewed, with modifications, from time to time since—the last renewal being in 1844. The Bank transacts the financial business of the Government at a small percentage, and has the sole right of issuing *Bank Notes* for a distance of sixty-five miles round London. These notes, though but *promises to pay*, are a legal tender, and are issued against a sum of about fifteen millions sterling lent to the Government under the *Charter*, together with the amount of bullion in reserve. What is generally known as a *Suspension of the Bank Charter* is a suspension of bullion payments by the Bank for these notes, relieving for a time the Bank of England of the obligation to pay these notes in gold, and yet keeping them a legal tender. It amounts, in fact, to an Act of Indemnity to the Corporation of the Bank of England against any loss they might sustain by issuing their "promises to pay," or notes against private securities whose value might depreciate. It is only done to allay a panic, or a great demand for gold in the money market.

Bank Credit.—A credit by which a bank, on receipt of proper security, allows a person to draw on them to an agreed extent.

Banker.—A licensed dealer in money, who grants loans, discounts bills, and receives deposits at interest; he also acts as an agent for the payments and receipts of others and facilitates the remittance of money from place to place.

Bank Note.—A promissory note, payable on demand, issued by a banking company.

Bankrupt.—One who from inability to pay all his debts in full is compelled to close his business, and to put his affairs in the hands of his creditors or assignees for settlement.

Bankrupt's Certificate.—A document granted by the Court of Bankruptcy, after examination of the bankrupt, and investigation of his affairs. It is the practice to allow first, second, and third class certificates, according to the merits of each particular case. In extreme cases, a certificate is altogether refused, when the parties are termed *uncertificated bankrupts.* A bankrupt is discharged by the certificate from all previous obligations. Under the new Bankruptcy Act, no protection is granted to the bankrupt unless or until he pays ten shillings in the pound.

Bankruptcy Court.—A court established to inquire into the cause of a bankrupt's failure, and to regulate the administration of his effects.

Barratry.—Any act committed by the master or crew of a vessel by which the owner or insurer is defrauded.

Barter.—The exchange of one kind of commodity for another without the aid of money.

Bear.—A speculator on the Stock Exchange who contracts to deliver stock or shares which he does not possess, at a certain price and at a future fixed period: his expectation being that a *fall* in the market quotations will allow him to buy them at a lower rate, previous to the arrival of the day appointed for settling. (See *Bull.*)

Bill of Entry.—A schedule of goods entered at the Custom House.

Bill—Bill of Exchange.—A written order from one person to another to pay a third party, or anyone whom that third party may appoint, a certain sum of money.

Bill of Health.—A certificate granted by properly authorised persons of the state of health of the crew of a vessel, and of the port which it leaves.

Bill of Lading (*B/L.*).—The master's acknowledgment of goods received on board a ship, and ageeement as to their delivery, freight, etc. They are usually granted in sets of three—one to be sent by the shipper to the consignee, the second to be sent to the same party by an after post (in case of loss of the first), and the third to be kept by the shipper in the event of any claim arising against the insurers through loss or damage.

Bill Payable (*B/P.*).—A promise to pay money at a future date.

Bill of Parcels.—A bill or specification of goods sold. The term is falling into disuse—*invoice*, *account*, or *bill* being generally adopted in its place.

Bill Receivable (*B/R*).—A promise by a second party to pay the owner a certain sum of money at a future date.

Bill of Sale.—A contract conveying to others any specified interest or right a person has in goods, chattels, ships, etc.

Bill of Sight.—A form of entry at the Custom House when the importer or consignee of goods is ignorant of their exact description or quantity; it allows them to be landed for sighting or inspection, that he may be enabled to make a perfect entry for them.

Bill of Store.—A licence from the Custom House authorities, granting permission for ships' stores to pass free of duty; also permitting the re-importation of goods legally exported from the United Kingdom.

Black List.—A name given to printed lists (privately circulated among subscribers) of bankrupts, bills of sale, and other matters concerning the commercial standing of individuals and firms.

Board.—The directors or managers of a department of the State, public institution, or company, in their collective capacity.

Bonâ Fide.—*In good faith.* An expression used to imply that anything is done without fraud or deceit.

Bond.—A written instrument by which a person binds himself to pay money at a certain time or under certain circumstances.

Bonded Goods.—Goods in bond are those liable to duty, and stored in certain licensed or *bonded warehouses*, after bond has been given on behalf of the owners of the goods for the payment of such duty on their removal for home consumption.

Bonus.—An extra dividend to the shareholders of public companies; also applied as a term to periodical additions made to policies of life assurance consequent upon the general profits of the company assuring.

Book Debts.—Amounts standing in the books of traders as due to them. They are generally classed as *good*, *doubtful*, and *bad*.

Bottomry.—The mortgage of a ship by her master or owners for the purpose of obtaining means to effect repairs, or to procure any requisite for the ship. The lender takes the risk of the loss of the ship, and it rests with him to insure it; but at the end of the voyage the loan is repayable with the agreed amount of interest. A bond is usually given for the money so obtained, which is termed a *Bottomry Bond*. When a loan is procured on the cargo, which may be sold or exchanged during the voyage, the borrower's personal responsibility becomes the chief security, and is termed *Respondentia*.

Bought and Sold Notes.—See *Brokers' Contracts*.

Bounty.—A premium for the encouragement of a particular branch of industry.

Brocage, or Brokage.—A commission gained by transacting business for others, mostly used when the transaction has been illegal or of a mean description.

Brokerage.—The percentage or commission charged by a broker for negotiating any business.

Brokers.—Persons engaged to transact business, or make bargains for others. The principal are—*Produce Brokers*, *Bill Brokers*, *Stock Brokers*, *Ship Brokers*, and *Insurance Brokers*.

Brokers' Contracts.—Notes signed by brokers and forwarded to their principals immediately on the completion of purchases or sales; they describe the goods, and the conditions under which they are sold. These are also called *Bought and Sold Notes*.

Bull.—A speculator on the Stock Exchange, who contracts to take stock or shares (which he has no intention of paying for) at a future fixed period, and at a certain price, his expectation being that a *rise* in their market quotations will enable him to sell at a higher rate previous to the arrival of the day for settling. (See *Bear*.)

Bullion is properly uncoined gold or silver, though the term is often used to denote those metals both in a coined and uncoined state.

Call.—A demand for money on account of or due on shares in public companies.

Cambist.—A person skilled in the exchanging of money of various countries; also a name given to a book in which is given the equivalent in one country of the money, weights, measures, etc., of other countries.

Cancel (To).—To cross and deface a bill or bond of any description, by which act it becomes of no effect.

Capital.—The original sum of money embarked in a business or public company, as it may stand affected by subsequent gains or losses.

Capias ad Satisfaciendum (or *Ca. Sa.*).—A writ commanding the defendant in an action at law to be arrested and kept till his debt be paid.

CARGO.—The goods and merchandise contained in a vessel. The person whose duty in the ship it is to look after the cargo is called the *supercargo.*

CASH ACCOUNT.—An account in which nothing but cash transactions are recorded.

CHAMBERS OF COMMERCE.—Local associations of commercial men, formed for the purpose of regulating and protecting their general interests.

CHARTER.—A grant from the Crown conferring privileges upon public companies, corporations, and institutions upon certain conditions.

CHARTER PARTY—An agreement with the owner or master of a vessel, hiring it either for a fixed period, a voyage, or a number of voyages.

CHEQUE OR DRAFT.—An order to a banker to pay the bearer, or a party named on the order, a certain named sum of money.

SPANISH.—XII.

[*Continued from p.* 188.]

THE TENSES OF THE SUBJUNCTIVE MOOD.

THERE are in Spanish three forms of the imperfect subjunctive, one ending with *-ra* (in the first person singular), another with *-ría*, and the third with *-se*. Each of these forms is generally to be rendered in English by some of the auxiliaries, *should*, *would*, *might*, *or could*, as the sense may require. These forms of the imperfect are thus used:—

The form ending with *-se* is employed only when a conditional conjunction, or an ejaculatory expression of desire, or a verb of command or permission, comes before it; as—

Era preciso que espusiese mis razones, *it was necessary that I should explain my reasons.*

Lo dije que tomase esos libros, *I told him that he might take those books.*

Sometimes the conjunction *que* is not expressed, but understood; as—

Encargó le enviasen mayor cantidad,	*He ordered (that) they should send him a greater quantity.*

The form ending with *-se* can be employed after the relative pronouns, and after cuanto, *as much as*, cuantos, *as many as*, when they are preceded by a verb expressive of an action which the other part of the sentence shows to depend on choice or mere contingency; as—

Prometió que me daría todo lo que le pidiese,	*He promised me that he would give me everything which I might ask of him.*

The form ending with *-ría* is employed (generally to express a *wish* or *condition*, or what *would be* or *might be* done) when no conditional conjunction comes immediately before the imperfect tense; as—

¿Cual de los dos preferiría V.? *which of the two would you prefer?*

Si ella viniese, irian, *if she should come, they would go.*

This form can likewise be used when the imperfect is preceded by a verb that expresses *belief*, *trust*, or *promise;* and also when the conjunction *si* (if) is used in the sense of *whether;* as—

Prometió que me daría dos libros, *he promised that he would give me two books.*

Le preguntó si su hijo iría allá, *he asked him if (whether) his son would go there.*

The form of the imperfect ending with *-ra* may in general be used for either the form in *-se* or that in *-ría;* and is especially to be preferred to the form in *-ría*, when interrogative pronouns come before the imperfect; as—

¡Ojalá me hallara con ella! *Oh that I could find myself with her!*

Yo quisiera que viniesen, *I should like that they would come.*

It will be seen from the foregoing rules that the form in *-ra* can generally be used instead of the forms in *-se* and *-ría*; for we can say, si yo amara, *or* si yo amase, *if I should love;* and we can say, él amara, *or* él amaría, *he would love.* But we cannot use the form in *-ría* as equivalent for that in *-se.*

Sometimes the English auxiliaries, *could*, *might*, *should*, and *would*, are expressed in Spanish by a separate verb, followed by the infinitive; as—

No podía ver, *he could not see (was not able to see).*

No quería entrar, *he would not enter (was not willing to enter).*

The perfect indefinite tense of the subjunctive mentions a doubtful or contingent action or event as being completed, or that it would have been done in past time under certain conditions; as—

Poco me importa que lo haya oido decir ó no,	*It concerns me little whether he may have heard it spoken or not.*

The pluperfect tense of the subjunctive mentions a doubtful or contingent action or event that would or might have been completed under certain conditions; and is also used in Spanish whenever in English a conditional conjunction or expression of fear, doubt, or wish precedes the pluperfect indicative; as—

Ella habría ido ayer á la catedral si hubiese estado buena,	*She would have gone yesterday to the cathedral if she had been well.*
No era creible que hubiese V abandonado á unos amigos antiguos como nosotros,	*It was not credible that you would have abandoned such old friends as we.*
¡Ojala hubiese yo sido estudioso!	*Oh that I had been studious!*

This compound tense of the subjunctive is used with the endings in *-ra*, *-ría*, and *-se* of the auxiliary verb *haber* (*hubiera*, *habría*, and *hubiese*), under the same conditions and in the same manner as these endings are employed in the imperfect tense; as—

Si no te hubiera pagado, yo te habría prestado dinero; *or*, si no te hubiese pagado, yo te habría prestado dinero; *or*, si no te hubiese pagado, yo te hubiera prestado dinero; *or*, si no te hubiera pagado, yo te hubiera prestado dinero;	*If he should not have (if he had not) paid thee, I would have lent thee money.*

The form of the last example, though permitted, is not to be recommended, since the ending *-ra* occurs in the conditional proposition (*si no te hubiera pagado*), and also in the principal proposition (*yo te hubiera prestado dinero*). Nor could we change in any case the principal proposition of the sentence, by substituting *hubiese prestado*, since the form in *-se* can be employed only with conditional conjunctions or exclamations, etc.

There is in Spanish a peculiar method sometimes employed for expressing such a contingency of an action as is implied in the pluperfect tense: this consists in prefixing the preposition *á* before the infinitive *haber*, and affixing the past participle of the verb to be used. Thus, "á haber venido" is to be rendered the same as "si hubiera (*or* hubiese) venido," *if he should have come*, or, as it is generally expressed in English, *if he had come*, or, *had he come*. So "á haber hablado" is to be rendered the same as "si hubiese hablado," *if he had spoken*.

The first future tense of the subjunctive mentions a doubtful or contingent action or event as to take place at a future time:—

Si así fuere, mis deseos quedarán satisfechos,	*If thus it should be, my desires will remain satisfied.*
Si yo hablare lénguas de hombres y de ángeles, y no tuviera caridad, náda soy,	*If I should speak with the tongues of men and of angels, and should not have charity, I am nothing.*

The second future of the subjunctive mentions a doubtful or contingent action or event as having taken place at a future time at or before some other future action or event shall occur:—

Si Pedro no hubiere llegado ántes de amanecer, le escribiré una carta.	*If Peter should not have arrived before daybreak, I shall write him a letter.*

A verb is not necessarily in the subjunctive mood because a conjunction may precede it; for an action or event which is known to be certain requires the verb to be in the indicative mood, even though a conjunction precede it; as, "though John was speaking low, I heard him distinctly," *aunque Juan hablaba*, etc. If, however, there is uncertainty or doubt expressed, the subjunctive mood is required; as, "though John were speaking, I would not listen," *aunque Juan hablara*, etc.

After the relative pronouns or the adjective cuanto, *how much*, or the adverb cuando, *when*, if these pronouns or this adjective or adverb are themselves preceded by a verb expressive of an action which the other part of the sentence shows to depend on mere choice or contingency, the subjunctive mood is used, though in English in such cases the indicative is generally employed; as—

Elige, pues, de estas naranjas la que mas te agrade (*or* agradare),	*Choose, then, from these oranges that which most pleaseth thee (may please* or *shall please thee).*
Seré rico cuando quiera (*or* quisiere) la fortuna,	*I shall be rich when fortune wills* (i.e., *when fortune may will*).
Prometió darme el dinero que yo necesitara,	*He promised to give me the money that I wanted (might want)*

Verbs expressing *will, desire, command, permission, promise, fear, doubt, probability, fitness*, or *necessity*, followed by the conjunction *que* (or any other conditional conjunction), generally require the verb which follows the conjunction to be in the subjunctive mood (and not in the indicative, as in English); as—

Dudo que tengas aceite, *I doubt whether thou hast (mayest have) oil.*
Es posible que tengan uvas, *it is possible that they have (may have) grapes.*
Es preciso que me vaya, *it is necessary that I go (may go).*
No creo que tenga peras, *I do not think that he has (may have) pears.*
Temo que no tengan dinero, *I fear that they will not have (may not have) money.*

There are some conjunctive phrases which, as they imply a condition or doubt in themselves, are always followed by the subjunctive mood; these are: para que, *in order that;* dado que, *granted that;* no sea que, *lest;* á ménos que, *unless;* á fin de que, *to the end that;* con tal que, *provided that;* ántes que, *before that;* supuesto que, *suppose that;* en caso de que, *in case that;* bien que, *although;* sin que, *without* or *unless that;* como quiera que, *notwithstanding that;* por mas que, *however;* siempre que, *whenever that;* ojalá, *would that*, or *would to God that;* as, hablo para que puedas juzcar, *I speak in order that thou mayest be able to judge.*

The conjunction ought always to be expressed in Spanish; as, "he promised us [that] he would come," *nos prometió que vendría.*

THE PASSIVE VERB.

The passive verb is generally rendered in Spanish by *ser*, and always when the subject of the verb is acted upon by an agent—that is, when in English it would be accompanied with the preposition *by;* as—

Esto discurso fué escrito por Diego,	*This discourse was written by James.*

The passive verb must be rendered in Spanish by *estar* when the past participle is used adjectively—that is, when the subject of the verb does not seem so much to be acted upon by an agent as to have its state or condition described; as—

El discurso estuvo bien escrito, *the discourse was well written.*
El libro está corregido, *the book is corrected.*

The passive verb formed by *ser* is used in Spanish in the present and imperfect of the indicative mood only when it is designed to express a mental act or a state of the emotions; as in this example—

María es amada de Cárlos,	*Mary is beloved by Charles.*

When a mental act or a state of the emotions is not expressed, the passive verb, if it be used, must not be in the present or imperfect of the indicative mood; thus, we cannot say, el libro es escrito por un Español, *the book is written by a Spaniard*, but, el libro ha sido escrito por un Español, *the book has been written by a Spaniard.*

When a mental act or state of the emotions is expressed, the prepositions *de* or *por* may be used after the passive verb before the agent; but when a mental act or state of the emotions is not expressed, *por* only can be used; as—

Todas las cosas fueron hechas por Dios, *all things were made by God.*

María es amada de (*or* por) Carlos, *Mary is beloved by Charles.*

The reflective pronoun *se* is often used with verbs of the active voice, which are required to be rendered in English by the passive.

THE REGIMEN OF VERBS.

The *object* or *regimen* of the verb is either *direct* or *indirect*. The *direct regimen* is that on which the action immediately falls without the aid of any preposition; as—

Doy una pluma,	*I give a pen.*

The *indirect regimen* is that on which the action of the verb cannot fall without the aid of a preposition; as—

Dijo á la muger,	*He said to the woman.*

Sometimes both regimens are required after the verb; as—

Dió una pluma á la muger,	*He gave a pen to the woman.*

When the object of an active verb is a person or inanimate thing personified, it must be preceded by the preposition *á*;* as in these examples—

La muger á quien vimos no es rica, *the woman whom we saw is not rich.*

Diego vió á la madre de Juan, *James saw the mother of John.*

Sometimes the harmony of the sentence requires the *á* to be suppressed, especially after the persons of the verb tener, *to have* or *to possess*; as—

Tengo un hijo y tres hijas,	*I have one son and three daughters.*

One verb governs another in the infinitive mood; as—

Quieren imitarle,	*They want to imitate him.*

Some verbs, as a general rule, require the preposition *á* before the infinitive which they govern, such as those which mean *to attempt, to come, to go, to begin, to devote, to offer, to dare, to serve, to invite, to learn, to teach, to urge, to assist, to call, to advise, to submit, to prepare, to compel, to decide, to remain,* and *to accustom oneself*; as—

Probo á levantarse, *he attempted to raise himself.*

Voy á verla, *I am going to see her.*

Some verbs generally require the preposition *de* before the infinitive which they govern, such as those which mean *to cease, to be glad, to be ashamed, to resolve, to deprive, to fail, to finish, to abstain, to pity*; as—

Dejó de estudiar, *he ceased to study.*

No faltaré de hacerlo, *I will not fail to do it.*

When the preposition *to* in English is used before the infinitive in the sense *in order to* (as *he labours to acquire fame*, meaning *he labours in order to acquire fame*), the preposition *para* is used in Spanish before the infinitive; as—

El hombre fué criado para aspirar á la felicidad,	*Man was created in order to aspire to felicity.*

Sometimes *que* precedes the infinitive instead of *por* or *para*; as for example—

Tiene algo que decirte,	*He has something (which) to tell thee.*

The infinitive is often used without any preposition before it, especially when it is governed by verbs which mean *to be able, to permit, to wish, to endeavour, to make, to feign, to owe, to seem, to be wont, to know, to avail, to see, to hear, to succeed, to hope, to be necessary, to think, to believe, to promise, to deign, to be the duty, to pretend, to judge, to prescribe, to require, to suffice*; as—

No puede hacerlo, *he is not able to do it.*

Deseo aprender, *I wish to learn.*

The infinitive in Spanish, when used as a present participle in English, may take any preposition before it; as—

Sintió la necesidad de ponerle en manos de la juventud,	*He felt the necessity of placing it in the hands of the youth.*
Es constante en amarla,	*He is constant in loving her.*

The verbs *to see* and *to hear* never govern the gerund in Spanish, but always the infinitive; thus, we cannot say, le vi viendo, *I saw him coming*, but, le ví venir, *I saw him come.*

To know how is expressed in Spanish by *to know*; as—

Yo no sé nadar,	*I know not (how) to swim.*

The infinitive, when governed by another verb in Spanish, is sometimes required to be rendered by another mood in English; as—

Piensa morir de alegría,	*He thinks to die (that he will die) of joy.*
Sabe deber su mérito á Dios solo,	*He knows to owe his merit (that his merit is owing) to God alone.*
Creo ver á mi padre,	*I believe to see (that I see) my father.*

When in English a reflective verb, or a verb implying command, governs an infinitive in the passive voice, in Spanish this infinitive must be in the active voice; as—

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* This is a very important rule of Spanish syntax.

No te dejes vencer malo, *suffer not thyself to be overcome of evil.*
El rey se lo mandó dar, *the king ordered it to be given to him.*

When a verb is governed by another in English, and can be rendered in another mood by using the conjunction *that*, this latter mood should be employed in Spanish; as—

Espero que tendré el gusto de verle en breve,	*I hope to have (that I shall have) the pleasure of seeing him soon.*

VERBS FOLLOWED BY CERTAIN PREPOSITIONS.

Verbs which signify *to compare, to give, to yield, to resist, to concern, to belong, to refuse, to ask, to promise, to owe*, etc., generally require the preposition *á* before the noun to which the action of the verb passes over; as—

Ella se parece á su madre,	*She resembles her mother.*
Demanda sabiduria al Señor,	*He asked wisdom from (to) the Lord.*

Sometimes verbs having the sense *to remove* or *to take away* require the preposition *á* before the noun to which the action of the verb passes over; as—

Cain quitó la vida á su hermano Abel,	*Cain took away the life of (to) his brother Abel.*
Cortaron la cabeza á Saul,	*They cut off the head of (to) Saul.*

Verbs denoting *to be abundant, to lack, to be astonished, to blame, to repent, to pity, to make use, to absolve, to make sport, to remember, to forget*, indirectly govern a noun by means of the preposition *de*; as—

Los valles abundan de trigo,	*The valleys abound with (of) wheat.*
Los discipulos se asombraron de sus palabras,	*The disciples were astonished at (of) his words.*
Llenaron la casa de perros,	*They filled the house with (of) dogs.*

Olvidar, *to forget*, is followed by *de* only when it is used as a reflective verb; as—

Olvidarse de lo pasado,[*]	*To forget the past.*
Olvidar su nombre,	*To forget his name.*

The verb *ser*, when used to imply property or possession, requires the noun denoting the possessor to be preceded by the preposition *de*; as—

El libro es de mi padre,	*The book belongs to (is of) my father.*

De generally precedes nouns which denote the causes of which the verb explains the effect; as—

Tiembla de miedo,	*He trembles with (from) fear.*
Tirita de frio,	*He shivers with (of) cold.*
Sus ojos se bañaron de lágrimas,	*His eyes were wet with (of) tears.*

The preposition *á* (to) should not be used in Spanish when we speak of motion merely directed towards a place, but *hácia* and *para*; as—

Está caminando hácia Tolosa,	*He is journeying towards Tolosa.*
Mi padre salió para Madrid,	*My father set out for Madrid.*

Gerunds require the same prepositions as the verbs from which they are derived; as—

Acordándose de sus obras,	*Remembering his works.*

NOTE.—The student will find at the end of the series of lessons a useful table of verbs governing certain prepositions.

USE OF THE VERBS *SER* AND *ESTAR*.

The right manner of using the verbs *ser* and *estar* being of great importance, and yet attended with some difficulty to students, we will give a few explicit rules.

Ser is used to affirm the existence of essential, natural, permanent, or characteristic states or qualities of the mind, persons or things, and to affirm what, or of what a person or thing is, was, or will be; as—

El yelo es frio, *ice is cold.*
Soy sobérbio, *I am proud.*
Lóndres no es pequeña, *London is not small.*
Perdonar las injúrias es obrar como Cristianos, *to forgive injuries is to act like Christians.*
La miel es dulce, *honey is sweet.*
Es tarde, *it is late.*
Pedro era capitan, ahora es mayor, y será coronel, *Peter was captain, now is major, and will be colonel.*

The natural beauties of the body, and its defects when regarded as permanent, are affirmed with *ser*; as—

Lucía es hermosa, *Lucy is beautiful.*
Ella es corcobada y ciega,[†] *she is hump-backed and blind.*

The materials of which anything is made are affirmed by *ser*; also the possession or destination of anything; as—

La taza es de oro, *the cup is of gold.*
La corona es de la reina, *the crown is the queen's.*
Cervantes es de Alcalá, *Cervantes is from Alcala.*
Es de dia, *it is day.*
Este vino es de España, *this wine is from Spain.*
Esta flor es para María, *this flower is for Mary.*

Estar is used to affirm the temporary, non-natural, accidental, or contingent condition or location of persons or things, transient emotions of the mind—that is, to affirm how or where a thing exists, existed, or will exist, at any period of time; as—

El tiempo estará nublado, *the weather will be cloudy.*
El mar está airado, *the sea is raging.*
Estoy alegre, *I am merry.*
Esta enfadado, *he is angry.*
Yo estaba ciego,[‡] *I was blind.*

The physical changes and state of health of the animal body, as also the chemical and mechanical changes of substances, are affirmed by *estar*; as—

Estoy bueno, *I am well.*
Yo estaba cojo, *I was lame.*
La leche está ágria, *the milk is sour.*
V. está despierto, *you are awake.*
La carne estaba asada, *the meat was roasted.*

In affirming any manner, situation, position, or location of persons or things, *estar* is used; as—

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[*] Literally, *to forget oneself of the past.*

[†] That is, permanently blind.

[‡] That is, blind for the time.

Juan está de moda, *John is in the fashion.*

La comida está en la mesa, *the dinner is on the table.*

Está de rodillas, *he is on his knees.*

¿Donde está mi padre? *where is my father?*

Estoy de prisa, *I am in haste.*

Está en la cama, *he is in bed.*

Estar (and not *ser*) is always employed before the gerund, since this serves to show the manner of being occupied; as—

Jorge está silbando, *George is whistling.*

Ellos están leyendo, *they are reading.*

Ella estará regañando, *she will be scolding.*

Estoy escribiendo, *I am writing.*

Estar is sometimes used with a preposition to form a particular idiomatic phrase: thus, estar sin means *to be destitute of;* estar á, *to understand;* estar en, *to be resolved on, to know.*

The manner of using *ser* and *estar* in forming the passive voice has already been explained.

IDIOMATIC USE OF CERTAIN VERBS.

Volver á, *to return, to repeat,* is used before an infinitive when it is required to repeat the action denoted by the infinitive, in which case the adverb *again* would be used in English, and the infinitive be rendered in the same tense as *volver;* as—

Volví á verle, *I saw him again* (literally, *I returned to see him*).

Volvió á escribir la carta,* *he re-wrote* (or *wrote again*) *the letter.*

Acabar de, *to finish from,* is used before an infinitive in the sense of *to have just,* and the infinitive is rendered in English as a past participle; as—

Juan acaba de llegar, *John has just arrived.*

Acabo de verle, *I have just seen him.*

Estar para, *to be towards,* is used before an infinitive in the sense of *to be ready,* or *to be about to;* as—

Estaban para acabar sus estudios, *They were about to finish their studies.*

Estar por, *to be for,* is used before an infinitive to show that the action implied in this infinitive is not yet performed, but that there is a disposition to accomplish it—that is, in the sense of *to be not yet,* or *to have a mind to;* as—

La casa está por acabar, *the house is to finish,* i.e., *the house is not yet finished.*

Estoy por ir á verle, *I am for going* (or *have a mind to go*) *to see him.*

Quedar por, *to remain for,* is used before an infinitive in the same manner as *estar por,* in the sense of *to remain yet;* as—

La carta queda por escribir, *The letter remains yet to write* (*remains to be written*).

Haber de, *to have of,* is used before an infinitive in the sense of *to be to,* or *must;* as—

No han de hacer uso de ellos, *they are not to* (*must not*) *make use of them.*

He de trabajar, *I am to* (*I must*) *work* (or *I have to work*).

Tener que, *to have what,* is used before an infinitive in the sense of *to have to,* or *must;* as—

Tiene que levantarse al romper del día, *He has to rise by break of day.*

Llegar á, *to arrive at,* is used before an infinitive in the sense of *to come to,* or *to succeed in;* as—

Cuando el hombre llega á gustar los encantos de la virtud, la prefiere al vicio, *When man comes to taste the delights of virtue, he prefers it to vice.*

Venir á, *to come to,* is used as *llegar á,* in the sense of *to come to;* as—

Los dones vienen á ser perjuiciales, *Gifts come to be injurious.*

Hacer is used impersonally before nouns referring to the weather, and is to be rendered by the verb *to be,* and sometimes with the adjective; as—

Hace calor, *it is hot.*

Hace buen tiempo, *it is fair weather.*

Tener is used in the sense of *to be* before nouns of measurement, with the preposition *de* in the sense of *in;* as—

Goliáth tenía de altura seis codos y un palmo, *Goliath was in height six cubits and a span.*

Gustar, when it is to be rendered in English by *to like,* has for its nominative case in Spanish what is the objective in English, and its objective in Spanish is the nominative in English, preceded by the preposition *á,* the sentence generally containing what in English would be regarded as a redundant pronoun; as—

¿Le gustan á V. patatas? *do you like potatoes?*

Ella me gusta á mí, *I like her.*

Faltar, when it is to be rendered in English by *to want,* or *have need of,* requires the same idiomatic construction of the sentence as *gustar;* as—

Á Pedro no le falta dinero, *Peter wants* (or *needs*) *not money.*

Le faltan tres vasos, *he wants* (or *needs*) *three tumblers.*

Hacer falta, *to make need,* is used in the same manner as *gustar* and *faltar,* in the sense of *to have need of, to stand in need of;* as—

Me hace mucha falta el consejo de V., *I stand in much need of your advice.*

Pesar, when it is to be rendered in English by *to repent of, to be sorry for,* is subject to the same peculiarity of construction as *gustar* and *faltar,* except that it is used before an infinitive with the preposition *de,* which infinitive would in English be used as a participle; as—

Á Dios le pesa de haber hecho rey á Saul, *God repents of having made Saul king.*

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* Literally, *he returned* (or *repeated*) *to write the letter.* It must be kept in mind that this is the usual mode in Spanish of expressing the repetition of an action, instead of using a word corresponding to *again* in English.

"It repents God for having made Saul a king," would be a more literal rendering of this last example.

THE ADVERB.

Adverbs are either derivative (or primitive) or adverbial phrases.

The simple adverb, when it qualifies a verb, generally comes after the verb; as—

La religion expresa sublimemente esta verdad,	*Religion expresses this truth sublimely.*

THE ORGANS OF SENSE.—X.

[*Continued from p.* 178.]

V.—THE ORGAN OF TOUCH (*continued*).

A MULTITUDE of other points of interest might be dwelt upon did space permit. Thus, sensitiveness to tickling, and the improved appreciation of objects by moving the skin over them, would lead us into considerations quite different from those connected with simple touch.

The sense of heat and cold is different from that of simple touch; and sensitiveness to these has no relation to the cognisance of tactile sensations. If with a cold finger you touch your brow, though the finger will feel any roughness on the brow far sooner than the converse, yet the brow feels the finger cold far more distinctly than the finger feels it to be warm.

We pass on to notice briefly some yet more important applications of the sense of touch; and in order to do this, it must be explained that the means by which we distinguish between hard and soft, rough and smooth, elastic and non-elastic, sticky and slippery bodies, by which also we gain our ideas of the form, size, distance, and situation of bodies, involves other sensations than those of simple touch. These ideas lie at the foundation of all mathematical science which treats of time and space. They are derived from the joint senses of touch, and of what has been called the "muscular sense." Simple pressure produces a sensation, as when a body is placed on the palm of the hand while its back rests on a table, but if we remove the table, or lift the hand from the table, a further sense of weight is conveyed to the mind. This idea of weight is derived from the knowledge the mind has that the muscles which hold the hand up are being exerted. So if the tip of the finger be passed along the edge of the table, it creates not only a consciousness of a number of successive contacts, but also a consciousness that the muscles of the arm and hand are exerted, and their position and condition is being continually altered. Now the nerves which run from the muscles to the brain are quite distinct from those which run from the skin which overlies those muscles. These nerves, too, are quite capable of conveying definite information to the brain without the assistance of the nerves of touch. The naked arm (in the dark) may be passed through the air, where it touches nothing, and yet the range of its sweep, the position to which it is brought, and the amount of effort required to do all this are known to the mind. In some rare instances this sense is lost without any of the others being impaired, and a case is on record of a mother who could hold her child while she looked at it, but directly she looked away she let it fall, because the muscular sense (not the muscular power) was gone.

Having indicated the distinction between the muscular and tactile senses, we must leave the reader to follow out for himself the complicated applications of these combined senses to gain a knowledge of outward objects. How, for instance, both are necessary to distinguish india-rubber from clay or from marble; and how the ideas of length, extent, and solidity are gained by passing the hand in one, two, or many directions over the outside of bodies. Let him also notice the wonderful adaptation of the human hand to obtain all this information. If he will take the trouble to do this, he will be struck with the marvellous complexity of the ideas which come trooping into the mind when so simple an action is performed as the grasping an object with the hand. A very remarkable instance of the muscular sense is shown by the way in which the fingers, for instance, obey the will; let the reader will to touch the tip of his nose, the lobe of his ear, the angle of his jaw, his navel, his great toe —no sooner does he will it than it is done.

It has been shown in the previous lesson that the sense of touch, in its wider sense, is of a highly intellectual character. As an informant of the mind it is second only to the sense of sight, and in the suggestion of abstract ideas, it is, perhaps, superior even to vision itself. There is no fundamental conception in relation to matter which it cannot impart. Though devoid of every other sense, a man possessed of this can pursue the study of every science, if he will but surmount the difficulties which oppose themselves to his acquisition of the results of the experience of other men. Thus, blind men have taken to the study of mathematics, and by the aid of the figures of Euclid, conic sections, etc., given in relief, have acquired a knowledge which has placed them in an honourable position in the examinations at Cambridge. The very theory of light and all its laws are quite comprehended by such blind students. The sense of touch is absolutely bounded by the surface of the body, but it

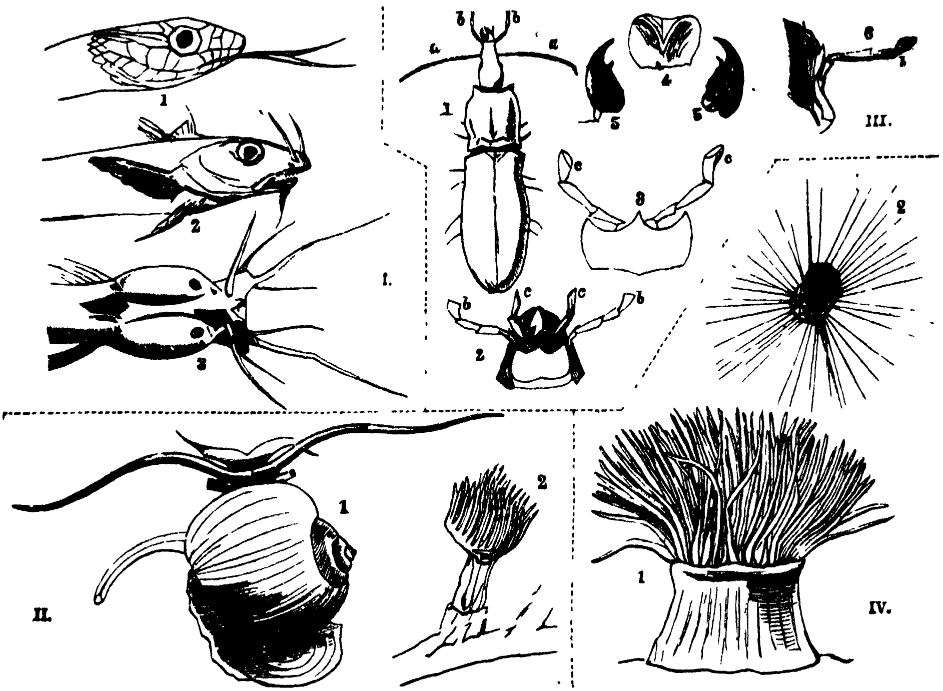

Fig. 14.—I. ORGANS OF TOUCH OF VERTEBRATA :—1, HEAD OF A SNAKE ; 2, HEAD OF AN OSSEOUS FISH—MOTELLA ; 3, HEAD OF A FISH —GYMNOLABES, SHOWING THE TENTACLES. II. ORGANS OF TOUCH OF MOLLUSCA :—1, AMPULARIA (APPLE-SNAIL), SHOWING TENTACLES ; 2, PLUMATELLA REPENS, SHOWING THE TENTACLES. III. ORGANS OF TOUCH OF ARTICULATA :—1, CARABUS VIOLACEUS (THE VIOLET CARNIVOROUS BEETLE)—(*a*) ANTENNÆ (*b*) MAXILLARY PALPI ; 2, ENLARGED VIEW OF UNDER PART OF HEAD (*c*) LABIAL PALPI ; 3, ENLARGED VIEW OF LABIAL PALPI ; 4, LABRUM, OR UPPER LIP ; 5, MANDIBLES, UPPER OR BITING JAW ; 6, MAXILLA, WITH ITS PALPUS OR LEFT LOWER JAW WITH ITS FEELER. IV. ORGANS OF TOUCH OF CŒLENTERATA AND PROTOZOA :—1, ANTHEA (SEA-ANEMONE), SHOWING TENTACLES ; 2, ACTINOPHRYS, SHOWING THE PSEUDOPODIA.

makes amends for being less far-reaching than other senses by being the most real of all the senses. We make our ultimate appeal for it when the eye gives false or confusing indications. In the King's Palace at Amsterdam there is a wainscot painted to express figures as if they projected from, and were carved, upon its surface. The shading is so well managed that the eye is completely imposed upon, and it is almost impossible to believe that the surface is flat. A rapid sweep of the hand, however, at once dispels the illusion; and so effectually, that when you move back to gaze again, it is difficult to regain the impression of an embossed surface. The unbelieving Thomas, however reprehensible his scepticism might be, expressed it both with force and delicacy; for he at once recognised that his own sense of sight might be deceived, and expressed a doubt, not of the truthfulness of the other disciples, but of their correctness of vision.

That this sense, when combined with the muscular sense, is of a highly intellectual character, does not at all contradict the statement that it is also the simplest and most rudimentary of the senses. That it is simple and rudimentary agrees well with the fact that satisfactory evidence may be found of its existence in most animals. The possession of this sense reaches far lower down in the animal scale than that of the other *special* senses. Definite organs of touch are well developed in animals in which no other organs of sense are found; and the power of extemporising feelers, or prolongations of the body into fingers or filaments, is a character of the very lowest animals with which we are acquainted. Reflection would tell us that this surface sense is almost essential to animal life. How necessary must it be for every animal that moves or feeds to know the exact limits of its body—the confines of the domain over which it has control;

what is part of itself, and therefore has to be nourished, cherished, and defended—what is foreign, and therefore may be used or avoided, as it is wholesome or noxious. Indeed, the sense seems indispensable to all animals that are not plunged and fixed, through every stage of their life, in the midst of a medium which is both air and food to them—to all animals, it might be said, whose life is not purely of the vegetative kind.

In the higher animals, and in all those whose means of defence lie more in their active powers than in defensive armour, the sense of touch is distributed over the surface of the skin, as in man. Every such animal may be compared to an island. The boundary of its body is the coast-line. Along the whole of this are placed, at various intervals, places of look-out, just as our own tight little island has been surrounded with martello towers. These stations are few and far between where the coast is rocky, abrupt, and inaccessible, but nearer together at those parts where a descent could be easily made, and crowded together at the outlets of ports, creeks, and river-mouths, through which an active commerce is carried on. The comparison of the extremity of the tactile nerves to martello towers is the more appropriate, because these have ceased to be of any use in defence, and have become stations of outlook for the coast-guard. So the tactile nerves are, *in themselves*, no protection, but rather, in being delicate organs, they need protection; for they act as alarmists, awakening and calling up the active powers to fight in defence of the common country. These two functions of the skin—namely, that of passive defence and active alarm—are complementary to one another: where one is very efficient, the other is less needed. In the scaled and mailed fishes, and in such forms as the tortoise among reptiles, and the armadillo among animals, the function of sensation is sacrificed to that of defence; but in the naked-skinned animals the sense of touch has need to be very acute. In comparing man with the lower animals of that class to which he belongs, we find that his sense of touch is, perhaps, better developed than that of any other animal. The lower animals have to sacrifice a certain amount of their surface sensibility to the paramount necessity of being shielded from the cold; or, to put it more truthfully, to the retention of their animal heat. Man has neither the continuous thick coating of hair of the ox, the thick skin of the rhinoceros, nor the dense accumulation of fat below it which is found in the pig and in the whale. He is only cosmopolitan because his superior intellect enables him to clothe and house himself. His nearest relatives among beasts, though much better supplied with hair than himself, are confined to the tropics. Man makes himself at home everywhere, but only by becoming a "clothes philosopher." His triple investment of ordinary, nether, and over clothing proves him to be an exotic species. He supplements by art the line of defence at those points where nature has left him exposed. The main use of the coating of hair is, no doubt, to defend the brute from the winter's cold, but that which will keep in the heat will keep it out, so that it may be considered as a defence against the excessive heat of the sun also. Doubtless the universal presence of hair on the heads of both sexes of the human species indicates that in his native home man had more to fear from sunstroke than from the cold of winter. Besides this, the hair is sometimes a real defence against the rough usage of the outer world. Thus the manes of the lion and the buffalo are real shields both against trenchant blows and the worrying of the teeth of hostile animals. Even the matted hair of the negro is said to be able to resist a tolerably forcible sabre cut. The principal use, however, is doubtless to defend from cold; and it is remarkable how this main object is arrived at without *much* prejudice to the function of touch.

Few solid substances are lighter than hair, even when pressed close; and few substances are worse conductors of heat—so that brutes retain their heat by the aid of a substance which costs them but little in the way of carriage. Beyond this, the springy, stiff, yet soft texture of hair makes it always permeable to the air; and air, *when motionless*, is a bad conductor of heat, and adds absolutely to weight. Hence on the coldest day, when the thermometer stands below zero, the beast is still surrounded with a layer of warm air, almost equal in temperature to its body. So much to prove its efficiency for its main purpose. Now we have to show how it leaves the sense of touch, if not unimpaired, at least not obliterated. The reader must refer back to the illustration on page 177 to understand the structure and relation of each hair to the skin in which it is developed and fixed. The hair is essentially a tubular projection of the cuticle, firmer and denser in its composition, being made up of closely-pressed, elongated, spindle-shaped cells, instead of scale-like, easily detached ones. It is not, however, produced from the level of the surface of the body, but from a bag or follicle, which is always narrow, and more or less deep as the hair is long or short. This horny tube dilates at the bottom of its bag to enclose a vascular papilla, similar in every respect to those papillæ which lie immediately under the surface of the superficial cuticle. The hair itself, like the rest of the cuticle, is without sensation; as indeed it need be for the comfort of the animal; but the papilla has not only blood-vessels but nerves, and is very sensitive, so that the hair cannot be pulled or moved in any direction without affecting the sensitive part. Though a furred animal cannot precisely tell the exact point at which it is touched, on account of the length and flexibility of its individual hairs, yet the sensation of touch is as truly conveyed to the true skin as it is when the pressed ridges of the forefinger of man cause feeling to be excited in the papillæ beneath them. In one respect hairs are even advantageous to the sense of touch, inasmuch as they reach considerably beyond the surface, and thus the range of the sense is extended. This advantage is so far recognised by nature that certain hairs are specially developed which have no other use than that of touch. These may fairly be described as tactile organs. These hairs are usually, and almost exclusively, situated in the upper lip, projecting from the most prominent part of the muzzle. In quadrupeds the snout is of course the most salient part of the body, and is most used in investigation. These whiskers, as they are called (though they would be better named moustaches), are remarkable for their length and stiffness, the depth to which their large bulbs run into the skin, and even protrude in the internal surface, and also for the large nerves that enter the papillæ of the bulbs. Those coming from the whiskers of the seal as they run together look like the strands of small cords as they become woven into a rope of tolerable thickness. The animals in which these whiskers are most developed are the carnivora and the rodentia. This is not improbably associated with the fact that these are for the most part nocturnal animals. Moreover, many of the rodentia inhabit holes in the ground, trees, etc.; and many of the smaller carnivora are always poking about in holes and crannies for prey. It certainly would be an advantage to a fox on a dark night to be able to gauge with his whiskers the size of the aperture in a hen-roost before he tried to force his way through it; and thus it has been thought that there is a relation between the width of the body and the extreme extent of the whiskers.

ELEMENTARY POLITICS.—III.

[*Continued from p.* 193.]

THE SPHERE OF GOVERNMENT (*continued*).

WE have seen that Governments in the last century claimed a very extensive control over the action of their subjects. About 1792, however, Wilhelm von Humboldt, who afterwards became the Prussian Minister of Education, wrote a little book, which was not published till many years afterwards. The true end of man, he said, was obviously to develop all his faculties as much as possible. To do this, (1) he must have a great deal of freedom; (2) he must be placed in a variety of situations and associate with people of very various characters. But that there may be variety of character, there must be general freedom. Now, supposing the Government steps in and says, "Such and such knowledge, or such and such traits of character, are specially desirable," and proceeds to train the citizens to get them. Here at once variety is decreased. Or suppose, instead of letting the citizens get things for themselves, it provides them. Suppose, for instance, that a college or a museum is provided out of taxation and not by private enterprise. The public interest in it must be much less than it would be otherwise; people care more for things that they have taken trouble to get. And, the more Government action there is, the more laws there must be. There will therefore be many more breaches of the law; and as some of these crimes will be morally indifferent, things will be punished that are not morally wrong, and law in general will be brought into disrespect.

Humboldt's doctrine was naturally very distasteful to the Prussian officials who controlled State education, and laid down minute police regulations designed for the good order of the nation. Much the same conclusions as Humboldt reached were adopted by those who were struggling for civil and religious freedom in England. They laid stress, too, on the inefficiency of Government action as compared with private enterprise, because the machinery of Government (they said) is much more complicated; it is slower to move; the officials are more hampered by tradition, and have less direct interest in the success of their work than private persons usually have. A more philosophical line (very like Humboldt's) was adopted by John Stuart Mill in the "Treatise on Liberty." He pointed out the importance of individual vigour of thought and action, and the great danger that if Government provided extensively for the welfare of its subjects, they would cease to provide for themselves. His book should be read by every student of politics, and we need only notice that he allowed much more of indirect protection than Humboldt did, and that he praised, what Humboldt expressly condemned, national compulsory education.

More recently Mr. Herbert Spencer has again maintained a view he first put forward forty years ago (in "Social Statics"), and has since repeated in essays called "The Man *versus* the State" and "From Freedom to Bondage" (the latter in "A Plea for Liberty"). His view is that all men having equal claims to happiness, which can only be defined as "consisting in the exercise of the faculties," Government should secure to each man that exercise, free as far as possible from other people's interference. But it should do no more. It should not protect men against *possible* interference—should not, for instance, punish drunkenness because drunken men may do harm, or even take precautions against the spread of infectious disease because people may catch it. Such action really defeats its own object; it leads people to trust too much to the Government, and to take little trouble themselves; it increases taxation, and so decreases the means of happiness; it involves a great deal of actual interference with freedom and happiness for the sake of what is after all only a chance of increasing them; and Governments very frequently make gross mistakes—more frequently, it is maintained, than private companies do. Let every man be as free as possible, and let the weak and foolish perish of their own weakness and folly. This is the way nature acts. It will be better for mankind so in the long run.

At present there is a strong feeling against this view everywhere. (1) Government seems likely to become much more democratic and much more efficient than any of the above writers expected. (2) It is seen that it is very difficult indeed to draw the line between direct and indirect protection of liberty. Is a man to be free to propagate infection which may injure hundreds of people, merely because we cannot say exactly who will be injured? If not, is he to be free (for instance) to keep his house or his yard in such a state that it may assist in propagating infection? Or is a man to be allowed to publish immoral books, which, though they may not directly cause offences against other people, yet interfere with moral character generally, and so indirectly promote these offences? (3) The notion that we are to allow civilised society to keep up the "struggle for life" we see in nature is denounced; civilisation, it is said, aims at getting rid of this struggle, and giving the weak a chance. Moreover, men are complex beings, and a weak person (that is, a person who would find it difficult to live unless the "struggle for life" were mitigated a good deal for him) may often have qualities most valuable to society. Why should we not—if we are sure we can do more good than harm thereby—let the Government (that is, persons delegated by ourselves and our fellow-citizens, and, on the whole, a good deal wiser and abler than most of us) do something to mitigate the struggle for life? If they abuse their power, they can be called to account; if they fail, other agencies would very likely fail too.

It is on these last two contingencies that the debate now chiefly turns. Governments, it must be remembered, are very cumbrous machines, under a great variety of influences, and far less responsible in practice than individual men, because it is so often difficult to fix the responsibility on any special persons. And it is well to keep the principles of Humboldt as to the end of the State in view—leaving each special case of extension of State interference to be decided on grounds of expediency.

It may simplify what we have been saying to summarise it thus:—

The functions of the State are—

(1) *Purely and directly preventive* of breaches of right, as when the State punishes theft or murder. Nobody disputes, of course, that these belong to the State.

(2) Indirectly preventive of breaches of right: *e.g.*, preventing the spread of infection; requiring buildings to be put up under certain restrictions, or machinery to be fenced; restricting dangerous trades, *e.g.*, that in explosives or intoxicants; punishing some forms of immorality, which, though not directly injuring other people's rights, may degrade their character and injure society indirectly.

(3) Promoting welfare: *e.g.*, by means involving restriction, national compulsory education, limitation of hours worked in factories.

[It is often difficult to separate these from (2).]

(4) Promoting welfare by providing institutions, etc., which might otherwise be provided by private enterprise (*e.g.*, the Post Office, the telegraph, the British Museum).

Sometimes (4) involves a certain amount of restriction of individual freedom; thus, people must not carry letters for profit and so compete with the Post Office.

It would generally now be held, as to (2) and (3), that restraint should be undertaken only in order to secure more liberty for people in general. Some people are to be compelled to do what they dislike, that people in general may have a better chance of more varied activity.

As to (4), the question in each case will always be one of expediency. Government may not do the work more cheaply than a private firm; but not aiming at profit, it may serve the public better.

FORMS OF GOVERNMENT.

It is best to begin by classing States as sovereign and partly sovereign. A partly sovereign State is one whose sovereignty is to some extent restricted by its subordination to some other State. Thus the English Government might (though practically it never does) refuse to sanction any particular law passed by the Legislature of the Dominion of Canada or any Australian colony. Nor can Canada or Victoria, or any other English colony, make peace or war, or conclude treaties, on their own account. Now, some of these partly sovereign States have assigned the part of their sovereignty which they do not possess to a Federal Union of which they are members along with other similar States. Sometimes, of course, States ally themselves permanently for certain purposes; and such a permanent alliance of several States is called a Confederation. In a Confederation the various members each retain their sovereignty, while they bind themselves to act together in dealing with other nations. But in a Federal Union they do more: they set up a central government and assign to it their powers of making war and peace, and of legislation on certain specified subjects—generally as to customs duties, coinage, the postal service, certain commercial matters, and of course the defence of the country; and they generally agree that none of them shall pass certain kinds of laws or do certain acts—*e.g.*, the various States of the American Union have bound themselves not to grant titles of nobility and not to permit slavery.

Partly sovereign States may be either dependencies (*e.g.*, New South Wales or Canada) or members of a Federal Union. A Federal Union is a body of semi-sovereign States, which reserve part of their sovereignty and delegate the other part to a central government. Sovereignty in a Federal Union is held to reside in the governments of the single members and the central government, all taken together Any sovereign State which is not a Federal Union may be called a unitary State. Such a State may of course have dependencies, as England has. And the dependencies themselves may be semi-sovereign Federal Unions, as Canada is. Federal Union only comes in where there is a central government to which part, but not all, the sovereignty has been delegated by a group of States severally.

Federal Unions may be either Republican or Monarchic, but those existing (with one exception, the German Empire) are in fact Republics.

Let us now turn to the other principle of division—the number of authorities with whom the sovereignty rests, or the composition of the sovereign body. If there is only a single ruler, the government is called a monarchy; if the government was in the hands of a number of persons who were exempt from the legal control of the rest of the population, it was called by the Greeks an oligarchy, or "rule of the few," or, as those "few" considered themselves (and often were) the best of the people, an aristocracy; while if the government was in the hands of the great mass of the people, the Greeks called it "the rule of the people," or democracy.

By combining this with another division—into Absolute and Constitutional—the philosopher Aristotle reached six types of State. An absolute government is one which does as it likes, without regard to principle or tradition; a constitutional government has regular principles and traditions.

In modern times we have not got much beyond this division. "Republic" is sometimes used for democracy, though historians (as in speaking of "the Dutch Republic" in the seventeenth century) often apply it to States where the supreme power is in the hands of comparatively few of the citizens. And "absolute" and "constitutional" States differ only in the degree in which they are bound by tradition. The despots of the little Greek cities, who were mostly mere adventurers plundering the people while they could, might (for a time) do pretty much as they liked. But a modern despot is very much in the hands of his officials, and they act on some sort of principle. Moreover, in some States the Constitution is written down: in others there is nowhere any formal authorised statement of it. Yet it does not follow that there is less respect for it in the latter class. England is among their number, yet England is an eminently constitutional country.

It would be difficult, however, to make more than a very rough classification, chiefly because the form and the spirit of a government differ widely. The old-fashioned division into monarchies, aristocracies, and democracies would class together the Governments of England and Russia, though the Government of England has infinitely more in common with the Republican Governments of the United States and France than with the despotism of the Czar. In almost all governments which are called monarchies, the sovereignty, in the legal sense, is not in the hands of one person, but of a king and a legislature which is either partly or wholly elected by the people. But the courtly language of official documents sometimes tends to obscure the fact. And in every country in Europe but Belgium the suffrage is either universal or very nearly so. Besides, many of the types of government have now only an historical importance. They have ceased to exist, and are not likely to reappear, at least in Western Europe or America. Aristocratic republics and (except in Russia) absolute monarchies are among these types. It is best, therefore, to enumerate the three leading types of government at present, omitting for the moment two peculiar cases, the German and Austro-Hungarian Empires.

1. *Constitutional Monarchy.*—Nominally in this type the head of the State is an hereditary king (or in some cases a queen), called for conciseness "the

Crown,* assisted by a body of Ministers generally chosen from the Legislature, and legislating by giving his consent to laws passed by that body. There are certain recognised principles which determine his action and that of the Legislature. The chief of these are sometimes written down in an authoritative document, in other cases simply understood; but as new circumstances arise and form precedents, much of the real Constitution is still unwritten always, even where there is a written Constitution. The head of the State directs the executive power and the judicial power, delegating the latter, of course, to judges of various grades, it being understood that a check on his action is secured to the Legislature by the fact that it, or sometimes the Lower House of it, votes the taxes necessary to pay the expenses of government. Moreover (thanks to the "patriarchal theory" we have before spoken of), the forms of legal language in use suggest that this head of the State is the possessor of the legal sovereignty, that the Ministry are only his advisers and the Legislature his subordinates. In practice, however, the case is just the reverse. The King may (if he has the ability) exercise a good deal of influence in the details of government. But on all points of the first importance it is understood (except in Germany and Austria) that he postpones his own wishes to the advice of his Ministers, and that they, and not he, are responsible to the country for acts done in his name. And the Ministers are selected by the leader of that political party which has a majority in the Legislature (or often in the Lower House of the Legislature) and can command its support. In fact, "constitutional monarchy" is really just the converse of what it professes to be. The most dignified and pretentious parts of the Government have the least real power; the King is less important than the Legislature, and the Upper House of the Legislature is practically (and usually legally) very much less important than the Lower. But everywhere the Crown has very considerable powers in reserve, and in a great emergency it may use them.

This constitutional monarchy has grown up under the peculiar circumstances of English history. Many of its features—*e.g.*, the existence of the Cabinet as a body of men belonging to the same party—have never been formally enacted in England by statute, and are not mentioned in official documents. The power of the Crown has practically died down gradually since the Revolution of 1688, especially during this century: the power of the House of Commons has practically increased at the expense of that of the House of Lords, especially since the Reform Act of 1832. More than any other Constitution, ours is worked by a number of tacit understandings which are not all to be found in the standard text-books, and which change from time to time. Thus the King never now in England either vetoes a Bill passed by the Legislature, or refuses to assent to the clearly expressed desire of the bulk of the nation, even if he disagrees with it. "The King reigns, but does not govern." Nor does the Upper House of the Legislature hold out permanently against the expressed desire of the majority of the nation. These understandings have more than once saved England from a revolution. Now, at the end of the last century the comparative freedom enjoyed by Englishmen induced Continental students to turn their attention to the English Constitution; and after the fall of Napoleon, the despotic kings who were restored in various European countries were induced to grant Constitutions more or less on the English model. But though the forms of the Constitution could be introduced, the political ability which made them workable, and the tacit understandings which made the Government very different from what it appeared to be, could not; and it can hardly be said that constitutional monarchy has in general been a very decided success outside of England.

There are, however, enormous advantages in the possession of an hereditary head of the State. The good old feeling of loyalty is easily called out by the worthy representative of a great historic royal house. It cannot possibly be called out by an elected party leader whose election has very likely been strongly opposed by nearly half the nation, and who has probably made bitter enemies in his previous career in politics. The King may exercise an excellent influence in social life, and may gain the love and respect of his subjects in a way that no elected president could. Personal respect to a king ensures the submission of many people to the Government who would hardly be capable of comprehending such an abstract idea as that of duty to the State. Especially is this the case in a great empire containing a number of politically backward peoples, such as those of the British Empire in India. And it is a great advantage to relieve the State from the turmoil, and it may be the danger, of an exciting presidential election. Moreover, it is inevitable that in that election personal scandals (real or false) should take much too large a place in the minds of the voters.

Now, both the other leading types of civilised government at present have sprung from the English system, though the rudiments of a similar system have existed at some time or other in most European countries, but have often been obscured or destroyed by the growth of so-called patriarchal monarchy. These types we may call Parliamentary (which includes, more or less, all existing monarchies save Russia and the French Republic) and Presidential, of which the leading instance is the United States. The Presidential Republic which exists there (and has been copied throughout South America with more or less success) grew out of the English monarchy: it is the English monarchy of the last century, with an elective Upper House, a Lower House elected by a very wide suffrage, and a Cabinet which advises the President, but is kept apart from the Legislature. Its members have not seats in either House: if they have a communication to make, they do so in a formal message, and they do not, like an English Minister, attend to be questioned as to the work of their departments. When the American system was formed, in fact, the Cabinet did not hold its present position in England, and much had been written as to the necessity of keeping the Legislature and the Executive distinct. The American system, however, has grave defects. The President and the two Houses of the Legislature are elected for different periods, but not in the same way. It is quite possible, therefore, that the President may be of one party and one or both Houses of another; and it often happens that before the President's term of office has ended, he and the Congress are in conflict. Nor is there any one official authority to initiate legislation. In England, practically the pressure of business is now so great that no important legislation is likely to pass unless it is brought in by a member of the Ministry. The Ministry have by custom control of the order of business in the House, and can secure time for its discussion. But in the United States Congress there is also great pressure, and there is nobody in Congress constitutionally in the position of the Ministry. The difficulty has been overcome by a constitutional understanding. The Speaker of the House of Representatives (who is not mentioned in the Constitution at all) is allowed something of the same power of deciding what business shall be taken first as the Prime Minister has in England, and it is quite understood that he is a party man, and that he does what his party desire in the arrangement of business. It is understood that "he must not go too far," but of course nobody can specify exactly where he ought to stop. In politics as in private business, such limitations must be left to the tact and judgment of the person acting, and the opinion of the persons whom he deals with.

The Continental "constitutional monarchies" all more or less follow the Parliamentary type of government, and so does the French Republic. Any private member of the Legislature (or in some cases of the Lower House of it) may bring in a Bill—*i.e.*, propose a law. But it is understood that the most important Bills will be proposed by a member of the Cabinet, and that the Cabinet will devote its influence to getting them passed. If it is defeated in the Lower House on any important question, it either resigns or dissolves Parliament. (Were it to refuse to do either, the majority in the Lower House could ordinarily make government impossible by "stopping the supplies"—*i.e.*, refusing to vote money for the expenses of Government.) Generally it resigns, though in some cases, as in Germany and Austria, custom does not require it to do this if the defeat is concerned with a matter of executive policy rather than of legislation, provided it still commands the confidence of the Crown. Usually in these countries the Cabinet is recognised by law, and the Ministers are also (as in England) members of one or other House of the Legislature; but they often have the right to speak in either House on matters affecting their own department, but not to vote except in that House of which they are members. Moreover, in some cases the Upper House of the Legislature co-operates in preparing Bills to be presented to Parliament. In the French Republic the President is elected by both Houses of the Legislature sitting together, and he cannot dissolve the Legislature without the consent of the Upper House. Otherwise, he is much in the same position as an English king or queen, dismissing his Ministers when they are defeated in the Legislature, and selecting others who he thinks will be able to command a majority of votes in it.

We see that we may now—though very roughly—class existing civilised governments according to one or other of several principles of division:—

1. Is there one central government with full powers (as in England), or one central government with certain specified powers, or a number of governments which reserve some powers for themselves (as in the United States)? In this latter type it is rather a puzzle to know where the Sovereignty is. The best authorities say it resides in all the governments taken together. This gives us the division into Unitary and Federative States.

2. Is the power (generally speaking) constitutionally in the hands of several authorities, or of one? This will give us Russia in one division, and all other non-barbarous States in another.

3. Taking the latter class, is there some one person in whom by the Constitution the supreme authority is vested, and who does not derive his power from the people by election? This will give us the division into Monarchies and Republics or Democracies.

4. Is the legislative authority carefully separated in most of its working from the executive? (It is necessary to say "in most of its working," because

total separation would mean that there is no proper Sovereign in the State, and then the State would not be a State at all.) If it is not separated, we shall have Parliamentary government. If it is, we shall have Presidential Republics and one type of Monarchy (the German and Austrian) in the same class. This shows, however, how classification breaks down when very complex objects are being classified and one attribute is made what logicians call "the foundation of the division." Nobody would naturally think of the Austrian Empire and the United States of America as in the same class, because when we look into details we find they are unlike in many more things than they are like.

A classification of governments, in fact, can only be by type. There are two great types (apart from Russia)—Constitutional Monarchies and Republics. England, in which elements which are partly not elective have a good deal of power (though they generally do not exercise it), is a constitutional monarchy. Switzerland, the United States, and France are republics or democracies, because all the powers possessed by any authority in the State are conferred on it by popular election. Of course the non-elective authorities may not use their powers, and then the monarchy becomes very like a democracy in its practical working. Or the legislative part of the elective authorities may neglect their duties, or be too weak to perform them, so that the executive part tyrannises over the people. This often happens in South American democracies. Most of the monarchies of Western Europe, however, tend to resemble Parliamentary republics in their working; Germany, Austria, and Denmark being exceptions, in which the King or Emperor not only has rather more power by the Constitution than in Italy or Spain, but really uses some of the powers which elsewhere have fallen into disuse.

COMPARATIVE ANATOMY.—XIII.

[*Continued from p.* 188.]

VERTEBRATA (*continued*).

BIRDS.

THIS class of the vertebrates, though possessing an external configuration which apparently differs much from all other animals, is closely allied to, and may be considered as a modification of, reptilian type—the two constituting a great group, which Huxley has called Sauropsida.

The rule that animals are constructed according to their habits and the medium in which they live and move is beautifully exemplified in birds. Their bones are extremely light, and rendered still more so by being, in the majority of instances, permeated by air. The outer covering, or epidermis, which in the preceding divisions we have seen variously modified, also undergoes a wonderful change, thus contributing to the same end, and exhibiting a characteristic difference from the scale-clad cold-blooded animals we have described. The cuticle is no longer covered with scales, but with closely aggregated appendages, or feathers, which closely envelop the body, for the double purpose of maintaining warmth and assisting in aërial progression. Each feather is a mechanical wonder. When fully formed, a feather is composed of a central cylinder or quill, by which it is attached to the skin; a shaft, which is the tapering continuation of the quill; and the vane or beard which projects from each side of the shaft. The latter is composed of barbs and barbules. The feathers present some variations in size and form in different parts of the body. They are variously coloured, and form the chief feature of ornamental beauty of birds. The feathers are formed by the conversion of the cells of the outer layer of the epidermis (skin) into horn-like material.

The *Mandible* or *Bill* consists of two portions, formed by the elongated upper and lower maxillary bones, covered over with a horny sheath, which serves the place of teeth. Besides being a prehensile organ, the bill aids in the masticatory process to a certain extent, and in some birds—*e.g.*, the parrot—assists in climbing, thus acting as a third foot. It presents many interesting modifications of size and shape—from the filamentous cone of the humming-bird to the huge bill of the toucan. The food, and manner of obtaining it, peculiar to each species, determines the size, shape, and degree of hardness of the bill. Thus it is strong and hook-like in those which tear their prey; short and conical in the grain-eaters; probe-shaped in those which live principally on insects. In the ibis, the bill is curved down. In the jabiru (Fig. 40, I. *c*) it is bent up. It is dilated at the extremity in the spoonbill. Ducks, geese, etc., have the bill flattened. In some birds it is dentated. Besides these, there are a variety of shapes, extremely interesting.

The *Tongue* presents almost as many peculiarities as the mandible, and, like it, serves for the most part as an organ of prehension. It is composed of muscles, covered with a horny sheath, and supported by one or two bony pieces (hyoid apparatus), prolonged backwards behind the head (Fig. 40, VI.). This hyoid apparatus is very remarkable, especially in those birds which dart the tongue rapidly at insects, as the woodpecker (Fig. 40, VI.). In the latter, the tongue is armed at its tip with sharp-pointed processes for transfixing insects. In the fieldfare the horny sheath of the tongue terminates in fine filaments. In the snipe it is long and slender. It is very short in the kingfisher. The tongue of the goose has projecting from its sides a number of recurved spines. The honey-eaters have the extremity of their tongue furnished with a tuft of horny, hair-like filaments. These peculiar shapes of the tongue are, like the mandibles, determined by the kind of food, and the method of obtaining it. Beneath the tongue there are a number of small glandular masses, called salivary glands. These furnish a gummy-like fluid (saliva), which moistens the food. In the woodpeckers and other insect-eaters the saliva is viscid, to enable them to entrap insects.

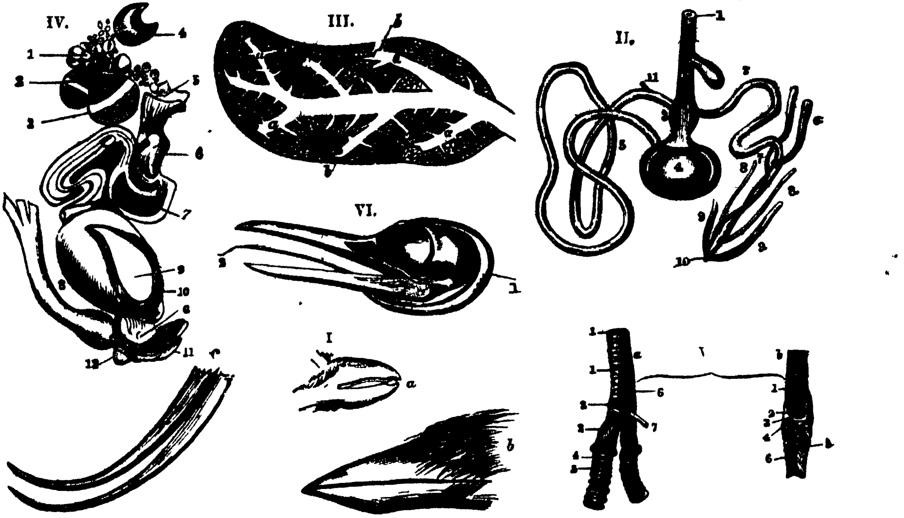

Fig. 40.—I BEAKS OF (a) SHRIKE, (b) CROW, AND (c) JABIRU. II. DIGESTIVE CANAL OF COMMON FOWL. III. DIAGRAM OF LOBULE OF BIRD'S LUNG IV. FEMALE ORGANS OF FOWL AT BREEDING SEASON (OWEN) V.a. INFERIOR LARYNX OF ROOK. V.b. VERTICAL SECTION OF INFERIOR LARYNX OF ROOK. VI. HEAD OF WOODPECKER (MILNE-EDWARDS).

Refs. to Nos. in Figs.—II. 1, gullet; 2, crop; 3, proventriculus; 4, gizzard; 5, small intestine; 6, cæca; 7, large intestine; 8, 8, ureters; 9, 9, oviducts; 10, cloaca; 11, process for attachment of yolk-bag. III. *a a*, subdivisions of bronchus; *b b*, smaller subdivisions. IV. 1, ova, or yolks; 2, vascular membrane of calyx; 3, zone; 4, empty calyx; 5, infundibulum; 6, 6, oviduct; 7, oblique ridges of lining membrane of oviduct; 8, shell-forming dilatation; 9, egg exposed; 10, villi, containing follicles concerned in the secretion of shell, 11, convolutions of oviduct; 12, cloaca. V.a, 1, trachea; 2, drum formed by the lower end of trachea; 3, middle ossicle; 4, first ring of the bronchi; 5, bronchi; 6, proper muscles of the larynx; 7, depressor muscles of the trachea. V.*b*. 1, inferior portion of the trachea divided as regards the half; 2, semi-lunar membrane; 3, osseous cross-bearer; 4, little rim formed by internal lip of the right glottis; 5, inner surface of right bronchus, formed by a tympaniform membrane; 6, portion of the cavity of the right bronchus exposed by a section of part of this membrane. VI. 1, hyoid apparatus; 2, tongue.

Alimentary Canal.—The first portion of the digestive tract, extending from the mouth to the stomach, is called the gullet. Its length is proportionate with the bird's neck. It is usually wide, and in some birds capable of great distension. At the lower part of the neck it communicates with a receiving cavity, or crop (Fig. 40, II.), where the food remains lodged for a time. A little below the crop there is another dilatation, the proventriculus, or second stomach (Fig. 40, II. 3), and below this a third, the gizzard. The crop is a temporary reception bag, the food lodging there until the gizzard is ready to receive it. It is single, but of large size in the common fowl (Fig. 40, II., 4). The pigeon has a double crop. In many birds it is wanting, the food passing along the gullet to the true stomach at once, or, as in some birds that swallow whole fish, the gullet is distended into a pouch-like cavity, serving the purpose of a crop. The proventriculus (Fig. 40, II., 3) may be smaller or larger than the gizzard. Its walls are thickly studded with small follicles called gastric glands, which pour out a fluid to macerate the food, and to reduce it to a condition more readily acted on by the gizzard. The gastric glands are variously arranged, and present some differences in size and shape.

The gizzard, composed of a dense aggregation of muscular fibres, is covered on its internal aspect by a dense skin-like membrane, thus forming a powerful agent for the mechanical reduction of the food. Many birds further increase the power of reduction by swallowing pieces of flint or other hard substances.

The intestinal portion of the alimentary canal retains much of the simple reptilian form. It varies from twice to eight times the length of the body. The first portion of the intestine immediately succeeding the stomach is called the duodenum, and is arranged in a characteristic loop-like fold, the interval being occupied by a gland called the pancreas, which is similar in structure to the salivary glands. The remaining portion is also more or less folded, and finally terminates in a short tube of greater calibre, called the large intestine. In the mammalia, the large and small intestines are separated by a valvular fold of the mucous lining; in birds, however, there is no such arrangement. The point of termination of the one and commencement of the other is marked by one or two pouches called cæca (Fig. 40, II., 6), one on each side of the intestine. They vary in length from a simple offset, as in the Solan goose, to processes some feet in length, as in the grouse. The interior of the cæca of the ostrich is arranged in a spiral manner. The cæca are wanting in many birds, as the cormorant, wryneck, toucan, some vultures, etc. The large intestine is short, straight, and destitute of folds, and terminates in the cloaca (Fig. 40, II., 10). There is an appendage (Fig. 40, II., 11) connected with the small intestine, the remains of the duct of communication between the yolk-bag and intestine in the chick. Birds have no complete diaphragm or partition muscle separating the thorax from the abdomen; consequently the liver, which is large and two-lobed, occupies a part of both cavities. It has appended to it a gall bladder and a bile-duct. The latter opens into the first part of the small intestine. The spleen is small. The kidneys are large, and lodged along the upper part of the pelvis. From each kidney a tube—the ureter (Fig. 40, II., 8)—passes downwards, terminating in the cloaca. Birds have no urinary bladder, the urine being voided along with the excrement.

The Respiratory Apparatus.—This consists of an air-tube (the trachea), with an upper and lower larynx, two lungs, and a number of air-sacs variously disposed throughout the body. The trachea, or wind-pipe, is a cylindrical tube, composed of a number of cartilaginous rings connected together by fibrous membranes. Its length accords with that of the neck of the bird. It is surmounted above, and also below, by a larynx. The upper larynx is homologous in position, and in some respects in structure, with the mammalian larynx. But not in function. The lower one is the true larynx (syrinx), whence emanate the sweet songs by which the feathered tribe relieve the stillness of country life

The rings which enter into the formation of the air-tube are not invariably of a uniform diameter, but sometimes present eccentric arrangements, as in the turkey, heron, eagle, etc., increasing in size from above downwards. Sometimes one or more chamber-like dilatations are found developed upon it.

The lower larynx is situated upon the inferior extremity of the trachea, just before its bifurcation into the bronchi. This complex apparatus will be best understood by a reference to Fig. 40, V., *a*, *b* (after Milne-Edwards). It may be compared to a kind of osseous drum, the interior of which is divided inferiorly by a traversing beam of the same nature, surmounted by a thin semilunar membrane (Fig. 40, V., *b*, 2). This drum communicates inferiorly with two apertures of the glottis (*rima glottidis*) formed by the termination of the bronchi, and each provided with two lips, or vocal cords. Finally muscles, whose numbers vary, extend between the different rings of which these parts are composed, and move them so as to stretch more or less strongly the membranes they support. In birds which do not modulate the sounds, the membranous septum is wanting. In those which do not sing there are no muscles proper to the inferior larynx. The lungs are small and undivided. A subdivision of the trachea (bronchus) enters the inner and lateral aspect of each lung, and after traversing the lung by smaller subdivisions (Fig. 40, III., *aa*, *bb*), communicates on their inferior surface, by four or more pairs of orifices, with the air-sacs of the body. The latter communicate with the interior of the bones. Respiration is thus seen to be a very active and complicated process in birds, and not confined to the lungs, but shared in by every part of the body where air penetrates.

Circulation.— The temperature of the blood exceeds that of any other vertebrates, ranging on an average from 100° to 109° or 110° Fahr. In sea-birds, as the gull, the temperature is lower than that of other birds, varying from 100° to 105° Fahr. In the common fowl it ranges from 107° to 110°. In the swallow it is said to be as high as 111½° Fahr. The blood-corpuscles are for the most part red and nucleated.

The heart is double, each half presiding over a separate system; the right one over the pulmonary, the left one over the general or systemic. The main object of the right system is to remove from the blood carbonic acid, which results from the waste-tissue products, and replace it with oxygen.

Nervous System.—The brain of birds makes some little advance towards the mammalian character. The cerebral hemispheres are increased in size, and possess traces of convolutions. The ganglia which preside over the sense of taste are small. The optic lobes are large, as might be anticipated from the keen sense of sight and the complete power of adaptation of it, at all distances, which birds possess. The cerebellum and spinal cord are both of large size.

The Skeleton.—The skull of birds is made up of a number of bones, separate in the young bird, but which, speedily growing, become inseparably blended together in the adult. The jaws, as already mentioned, are elongated, and both are movable. The lower one is connected to the cranial bones by the intervention of a second one called the quadrate bone. The skull is connected to the vertebral column by means of a single condyle. The vertebræ vary in number, the cervical ranging from ten to twenty. The dorsal, lumbar, and sacral vertebræ are generally found fused together and immovable. The coccygeal, which support the tail, are movable. The sternum, or breast-bone, is large and expanded, and has projecting in the median line a keel-like ridge, to increase the surface of attachment of the large elevator and depressor muscles of the wing. It has connected with it two bones: one small, the furcula, or clavicle; the other large and strong, the coracoid bone. The latter acts as a powerful fulcrum to the wing, as well as a point of attachment to muscles. The extremity of the bird's wing (hand) merely serves the purpose of a support for feathers. The legs vary considerably in length, according to habits. Each foot has three or four toes, terminated by claws, and in aquatic birds connected together by an intervening web—this is principally confined to the three anterior toes. The feet and legs are generally covered with horny, scale-like plates, and destitute of feathers. The power of flight which many birds possess is indeed wonderful. The muscles in connection with the upper extremity may be said to consist of two classes: one by which great power is obtained; and the other, speed at the expense of power.

Generative System.—In their reproduction birds are strictly oviparous. The generative organs exhibit for the most part a close analogy to those of the higher reptilia. The ovary is racemose and single, the right with its oviduct being permanently atrophied, a singular violation of symmetry which is confined to birds. In this class of Vertebrata incubation attains its highest perfection. It appears to arise from the concurrence of these three exigencies —the necessary life and early maturity of the young, the necessity of warmth to their development, and the incompatibility of utero-gestation with flight.

Classification.— Birds are divided by Professor Huxley into three orders:—

1. *Saururæ.*—Distinguished by having a long tail like a lizard. This order contains only the extinct bird, archæopteryx.

2. *Ratitæ.*—From their raft-like keelless sterna. This order comprises ostriches, rheas, emeus, cassowaries, and the apteryx.

3. *Carinatæ.*—Having the sternum raised into a median ridge or keel. All ordinary birds belong to this order.

MAMMALIA

We have described beings adapted to live in water; beings capable of living on land or in water; others that can soar in air far above earth's surface; and now it only remains to describe those animals which constitute the final link in so extensive a scale—and being final, in possession of forms the most beautiful, of faculties characterised by the highest degree of intelligence, and of peculiarities which distinguish them from every other division of the great vertebrate kingdom. The chief distinctive peculiarity is that of teats, which nearly all possess, and whence they take their name, the word mammalia coming from the Latin *mamma*, a teat. The preceding divisions are more or less independent of their parents for support. Not so, however, the mammalian young; helpless when born, they would hopelessly perish had not Nature provided the parent with breasts which furnish the secretion milk, and a corresponding degree of affection—the one to nourish, the other to cherish them until sufficiently matured to seek food for themselves. The teats vary somewhat in position and number. In man and the quadrumana they are situated on the chest; in flesh-eaters, over the chest and belly; in the cow, mare, etc., they are placed close to the hind extremities. They are two in number in the goat, elephant, and ape; four in the horse and cow; eight in the cat; ten in the rabbit and pig; and ten or twelve in the rat. Each milk gland consists of a number of small lobes bound together by connective tissue. Each of the small lobes is made up of still smaller ones, and each of these terminates in a small tube or duct. The ducts of the smaller divisions of each lobe join to form a common duct. The ducts so formed terminate at the central projecting part (nipple) of the breast. The chief constituents of the milk are: Caseine, butter, sugar of milk, alkaline and earthy salts, with traces of iron.

The lowest order of each great class is represented by beings which partake of the character of the next lowest class, and so we find it here. The Duck-billed Platypus (*Ornithorhynchus*), a native of Australia, has certain features which are essentially bird-like in character—*e.g.*, it has a bill like that of a duck, webbed feet, etc. It spends much of its time in water, though it has burrows excavated in the adjacent banks of the stream. Closely allied to it is a peculiar hedgehog-like animal, furnished likewise with a bill, and prickly spines on its back.

the porcupine ant-eater (*Echidna*). Both these forms lay eggs.

In the next stage towards mammalian perfection we find an extensive order of animals, principally found in Australia, Tasmania, and the islands of the Asiatic Archipelago as far as Java. A few species are found also in America. These are the marsupials, or pouched quadrupeds (kangaroos, opossums, etc.), so named from the presence of a bag, developed from the skin of the belly, in which they carry their prematurely brought-forth young during the helpless condition of infancy. Safe from danger in the pouch, the young are enabled to reach the maternal teats, by which they hang and are fed.*

With few exceptions, the mammalia have their skin protected with hair. In colour, shape, and strength, the hairs vary considerably, from the curly wool which keeps the sheep warm, to the protective spines of the hedgehog. The hair fulfils the following conditions:—Provides warmth to the body, adds to the beauty of the animal, forms a protective covering to the skin, and likewise, as in the timid hedgehog, a spiked coat of mail, a most formidable and invincible barrier to the would-be antagonist. Every hair is divided into a free part, or shaft, with its tapering point, and a root inclosed within a sac. In straight hairs, the former is generally straight and rounded; in the curly and woolly hairs, it is twisted spirally, and quite flat, or slightly ribbed. The root is always straight and cylindrical, and softer and thicker than the shaft; at least, at its lower part. In living hairs it ends in a still softer knob-like enlargement, two to three times thicker than the shaft, the bulb of the hair, which is placed, cap-like, upon a little process of the sac named the hair papilla.

The nails and claws are, like the hairs, modified epidermic processes, and, like it, consist of a soft and a horny layer.

Some animals, as the elephant, hippopotamus, rhinoceros, hog, horse, ass, etc., have remarkably thick skins, and on this account were formerly classed by Cuvier as a distinct order, under the name Pachydermata (παχύς, thick; δέρμα, skin).

METEOROLOGY.—III.

[*Continued from p.* 164.]

THE PRESSURE OF THE ATMOSPHERE.

THOUGH the barometer cannot safely be used as a weather-glass by the mere observation of how high or how low it is at any one time, as is suggested by the words "change," "fair," "set fair," etc., placed on the dials of aneroids and other popular forms of the instrument, there are a few general rules as to its height. It is generally high:—(1) in very cold weather when the lower strata of air are denser, (2) when the air is dry, and (3) when an upper current sets in towards its position. Conversely, the mercury is low in warm or damp weather or when the air is moving upward, as in the upcast shaft of a mine.

We thus get permanent high-pressure regions along the line of the tropics, and a low-pressure area along the equator, where the sun's heat produces a constant up-current. This upflow produces the *trade-winds* (*see* Vol. I., p. 146), whilst the earth's rotation gives to all winds a tendency to be deflected towards the right in the northern, towards the left in the southern hemisphere. The prime source of all movement in the atmosphere is the general temperature circulation set up between the equator and the poles, all wind arising from differences of pressure, the air flowing from a high-pressure area to a low-pressure area to restore equilibrium. Just as a river flowing down from its source to its mouth cannot slide straight down the incline like a solid weight on a board, but forms eddies or whirlpools in which the water gyrates downwards, backwaters in which it flows upwards, ripples, and other complex movements, so the air flows in various more or less complex spirals. The earth's rotation, which gives an easterly tendency to northerly winds and a westerly one to southerly ones in the northern hemisphere, will cause these spirals to travel, in that hemisphere, in the same direction as the hands of a watch, when surrounding a region of high pressure. This may be expressed by saying that the wind leaves the point of highest pressure on its right hand. Conversely, the wind flowing out of a region of low pressure circulates (in the northern hemisphere) against watch-hands, or so as to leave the lowest pressure on its left. In the southern hemisphere these conditions are reversed, the wind moving round a low-pressure area with watch-hands and round a high-pressure area against them. Though previously ascertained, this principle is known, from a professor of Utrecht, as Buys-Ballot's Law, and is often stated as follows:—

"In the northern hemisphere, stand with your back to the wind, and the barometer will be lower on your left hand than on your right. In the southern hemisphere, stand with your back to the wind, and the barometer will be lower on your right hand than on your left." Obviously, this law may be transposed into:—"If you stand (in the northern hemisphere) with the high barometer on your right and the low on your left, the wind will blow on your back."

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* Plutarch, in his treatise on the love of parents for their children, mentions these animals as an illustration of affection for their offspring.

Though lines known as *isobars* joining places having the same average barometric pressure for the year, or for any month in the year, have been for a quarter of a century laid down on maps, it is only comparatively lately that the tracing of *synchronous charts* by means of telegraphic communication at small intervals of time, generally daily, giving isobars for every tenth of an inch of the barometer scale, has shown a close connection of wind and weather, not only with the nearness of these curves, but also with their shapes. These synchronous charts are also called *synoptic charts*, as they enable the meteorologist to take a general view of the weather of a whole area, and, as they may contain, in addition to the isobars, isotherms, arrows marking the direction and velocity of the wind, and symbols to represent the conditions as to sky, cloud, rain, or snow, they are also known as *meteograms*. For example, Fig. 10 is the meteogram issued by the *Times* for January 1st, 1892, with the explanation published with it.

WEATHER CHART, THURSDAY, DEC. 31, 6 P.M.

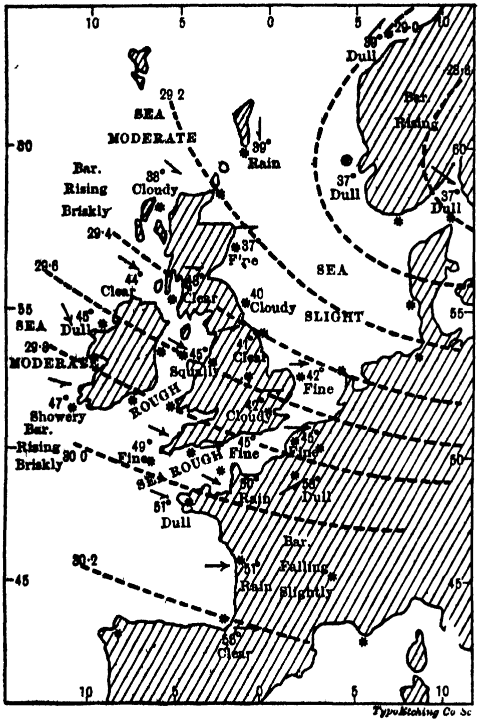

Fig. 10.

EXPLANATION OF THE CHART.

In the above chart the dotted lines are "isobars" or lines of equal barometrical pressure, the values which they indicate being given in figures at the end, thus—30·4. The shade temperature is given in figures for several places on the coast, and the weather is recorded in words. The arrows fly with the wind, the force of which is shown by the number of barbs and feathers, thus:— ⇀, light; ⟶, fresh or strong; ↣, a gale; ⤖, a violent gale; ⊙ signifies calm. The state of the sea is noted in capital letters. The * denotes the various stations.

The comparison of many thousand meteograms has led to the following generalisations:—*

1. That in general the configuration of the isobars takes one of seven well-defined forms.
2. That, independent of the shape of the isobars, the wind always takes a definite direction relative to the trend of these lines, and the position of the nearest area of low pressure.
3. That the velocity of the wind is always nearly proportional to the closeness of the isobars.
4. That the weather—that is to say, the kind of cloud, rain, fog, etc.—at any moment depends on the shape, and not on the closeness, of the isobars, some shapes being associated with good and others with bad weather.
5. That the regions thus mapped out by the isobars are constantly shifting their positions, so that changes of weather are caused by the drifting past of these areas of good or bad weather, just as on a small scale rain falls as a squall drives by. The motion of these areas is found to follow certain laws, so that forecasting weather-changes becomes a possibility.
6. That habitually in the tropics, and sometimes in the temperate zones, rain may fall without any appreciable change in the isobars, though the wind conforms more regularly to the general law of these lines. Such rain is termed "non-isobaric."

The seven fundamental shapes assumed by isobars—which are, as we have seen, comparable to the various forms of eddy, backwater, and ripple in a stream of water—are the cyclone, secondary cyclone, anticyclone, wedge-shaped isobars, straight isobars, V-shaped depressions, and cols. When we trace—as we shall briefly do—the observed connection between these various shapes and particular conditions of weather, we are not indulging in any theory or arguing from statistics, but adopting a *synoptical method* based mainly empirically upon pure observation.

The direction of the wind is always along the isobar, leaving the lowest pressure on its left hand (in the northern hemisphere), but not exactly parallel with the isobar but inclined towards the nearest low pressure at an angle between 30° and 40°. The velocity of the wind is roughly proportional to the closeness of the isobars, which is expressed by what is termed the barometric *gradient*. In engineering the same unit of measurement, the foot, is used for both the vertical and horizontal scales in a gradient; thus, a gradient of one in sixty implies a slope rising one foot in sixty. In meteorology, however,

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* Hon. Ralph Abercromby, "Weather."

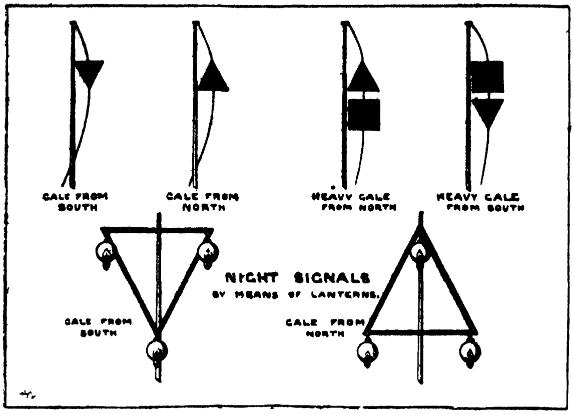

Fig. 11—Storm Warnings

into which science the term was introduced by Mr. Thomas Stevenson, the unit of the horizontal scale is 15 nautical miles and that of the vertical scale one-hundredth of an inch of the barometer. Thus, a gradient of 2 means a difference of 0·02 in. between isobars fifteen miles apart. This would give a fresh breeze. The gradient is measured at right angles to the isobars, just as we measure the slope of a hill at right angles to two contour lines Gradients seldom exceed four or five in Britain, and may be said to be moderate when below one and steep when above two As, on the Continent, a degree of sixty geographical miles, and a millimètre, which is nearly equal to 0·04 of an inch, are taken as standards of measurement, their gradients are almost identical with ours

THE MOVEMENTS OF THE ATMOSPHERE HOW THEY ARE CAUSED BY CHANGES OF PRESSURE, AND HOW THEY PRODUCE CHANGES OF WEATHER.

The movements of the atmosphere are familiar to us as *winds*, and though, as we have seen, their direction on a large scale is generally spiral, over smaller areas we commonly consider winds as blowing in straight lines. The distinction must be clearly borne in mind between the velocity of the wind, or its rate of motion in the spiral, and the velocity of a storm, or the rate at which the centre of a system of spiral movement shifts its position. These two movements are as independent as are the rate of movement of the earth round the sun and that of the sun itself through space.

The force and velocity of the wind is estimated according to the Beaufort scale, devised by Admiral Sir Francis Beaufort in 1805, which, omitting its purely nautical application, is as follows:—

Force.		Velocity in miles per hour.	In metres per second.
0.	Calm	3	1·34
1.	Light air	8	3·6
2.	Light breeze	13	5·82
3.	Gentle breeze	18	8·1
4.	Moderate breeze	23	10·3
5.	Fresh breeze	28	12·5
6.	Strong breeze	34	15·2
7.	Moderate gale	40	17·9
8	Fresh gale	48	21·5
9.	Strong gale	56	25·0
10.	Whole gale	65	29·0
11.	Storm	75	33·5
12	Hurricane	90	40·0

Of these velocities, 6 is the lowest number taken to justify the issue of warnings to the coast by our Meteorological Office, and 9 the lowest allowed by the Board of Trade to be pleaded as "stress of weather." These velocities are not supposed to be uniform, 48 miles an hour meaning 48 miles in the hour, allowing for violent gusts and lulls. The probability of strong wind is indicated at coast stations by the hoisting of a cone

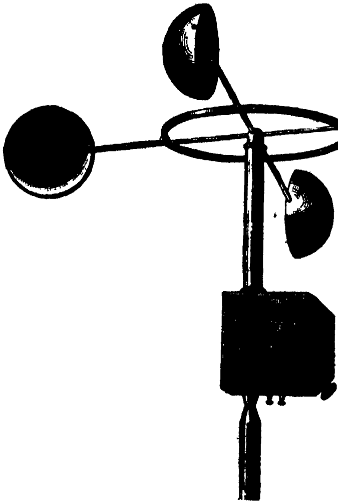

Fig. 12.—Anemometer.

of canvas, three feet high and three feet across the base, by day, or three lamps on a triangular frame by night. The *south cone* and its corresponding triangle has its point downwards, and indicates the probability of strong winds at first from the southward—*i.e.*, from S.E. veering to S. and to N.W. The *north cone* has its point upwards, and indicates strong winds as probable from the northward—*i.e.*, from N.W. veering to N. and S.E. (Fig. 11).

On weather-charts the direction of the wind is indicated by arrows which fly with the wind, and do not face it as does the vane of a weathercock. The weathercock is the instrument employed to give the direction, and care must be taken that its north point is set to the true, and not to the magnetic, north. We usually only use the eight principal points, out of the 32 points of the compass, in describing wind. The force of the wind may be approximately measured either by a *pressure anemometer* or by a *velocity anemometer*. In the first case, a plate of sheet-iron one foot square swings like the signboard of an inn; whilst *Robinson's anemometer*, the chief form of the latter type, consists of four hemispherical cups on the arms of a horizontal cross, rotating a vertical axis, which is connected by gearing to recording apparatus (Fig. 12). The force of the wind is indicated on the chart by the number of barbs and feathers to the arrows.

ENGLISH LITERATURE.--XVI.

[*Continued from p.* 199.]

THE RESTORATION PERIOD: DRYDEN AND THE POETS.

FROM what we have said in earlier lessons, our readers will be able to realise to some extent the strength of the reaction which followed upon the downfall of the Puritan influence and the victory of the Court party at the Restoration, and the effect which this change produced upon the literature of the age. Nothing can better show this contrast than a comparison of the character and career of Milton with that of Dryden; Milton the very type of a Puritan poet, Dryden by far the greatest, and probably the best, among the literary offspring of the Restoration.

John Dryden was born in 1631, of an ancient and honourable family, in the county of Northampton. After commencing his education at a school in the neighbourhood of his home, he was removed to Westminster School, then under the government of the celebrated Dr. Busby. From Westminster he was elected to a scholarship at Trinity College, Cambridge, where he took his bachelor's degree in 1654, though he continued to reside at the university for several years after this time. Dryden then removed to London, having in the meantime become possessed of a small fortune by the death of his father. His relatives were all of the Puritan party, and Sir Gilbert Pickering, a near kinsman, under whose immediate auspices Dryden entered public life, was a trusted friend and follower of Cromwell. Naturally, therefore, Dryden's first public efforts were upon the same side. The earliest of his poems of any great pretension is his "Heroic Stanzas on the Death of Oliver Cromwell." But Cromwell was dead, and the Restoration soon followed; and Dryden, like many another, abandoned the fallen creed to worship the rising sun. This event, however, brought Dryden no immediate improvement in fortune or circumstances, but the reverse; for the friends upon whose influence and protection he had formerly relied remained faithful to the fallen cause, and Dryden, separated from them, was left to rely upon his own resources. The first-fruits of Dryden's political conversion were two poems—"Astræa Redux," a poem in honour of the King's return, and "A Panegyric on the King on the Occasion of the Coronation." But Dryden had to live by his pen, and he therefore applied himself to that form of literature for which, in the reaction from the spirit of Puritanism, the demand was greatest and the reward surest—the drama. For many years, beginning very soon after the Restoration, he produced, in pursuance of an agreement into which he had entered, three pieces for the stage every year; and his plays show an inexhaustible variety in subject and character, though they are all alike in the dramatic defects which we shall have to refer to hereafter. Nor was his diligence in other departments less remarkable, in poetry and in prose alike. In 1670 he was appointed to the office of Poet Laureate, and, unlike the modern holders of the office, became Court poet in reality as well as in name, zealously devoting his great powers to the most servile and indiscriminate flattery of the King and his favourites, and the most violent attacks on all who opposed the party in power. Dryden had been educated among Puritans, but at the Restoration became a rigid Anglican, and wrote one of his greatest poems in defence of the Anglican position. But soon after the accession of James II. he abandoned his old faith and professed himself a Roman Catholic. Of course the honesty of a change of creed so sudden and so opportune has been much impugned; and though we may not be called upon to suspect Dryden of conscious insincerity in this change any more than in any other of his transitions, religious or political, they at least show the absence of that earnestness of purpose and strength of conviction which characterised the preceding generation, and the want of which marked the age of the Restoration beyond all other periods in our history.

Dryden married, in 1663, Lady Elizabeth Howard, daughter of the Earl of Berkshire, but the marriage was not a happy one. His literary labours were carried on with unceasing diligence down to the time of his death. He died of dropsy in the year 1700.

Before speaking in any detail of Dryden's works individually, it may be well to point out what were the leading features of his genius, what qualities as a poet he had, and what he wanted. The power of pathos is wholly absent in him; he neither arouses our sympathies nor touches our pity. He addresses himself to the reason and judgment, not to the passions or emotions of his readers. The dramatic faculty, again, is very defective in Dryden. He can describe characters with unequalled power and felicity—the satirist's art; but he cannot place them before our eyes living and in action—the dramatic art. But Dryden was a man of immense intellectual ability, capable of being applied with success to almost any task, equally strong in argument and in satire. His observation of the salient points of character was keen, and his judgment in handling every subject with which he dealt admirable. But his greatest gift—that in which he specially excels alone among poets—is his power of expression, style, and versification. His language is everywhere a perfect model of English style—clear, simple, nervous, full of variety and of dignity. In every line there is a force and elevation rarely attained by any other poet, the unmistakable presence of the *vis divinior* of the Latin poet. His verse has been the admiration of each succeeding generation.

From what we have said, it will easily be believed that Dryden's plays are not the works on which his fame should be rested. They are brilliant frequently, with plenty of variety of incident, and the versification (for his plays are, for the most part, in regular rhymed verse) is admirable. When they were produced, they enjoyed an unbounded popularity. But that was an age in which Shakespeare was despised, and the Elizabethan drama held barbarous. And to a sounder taste Dryden's plays are wearisome, wanting in every dramatic element. But their number is an extraordinary evidence of the unwearied diligence of their author.

The second class of Dryden's works consists of poems in honour of public persons or public events. Some of this class, those addressed to Cromwell and to Charles II., we have already mentioned; but the most remarkable of such poems is the "Annus Mirabilis," the first in point of date of his more ambitious poems. Its subjects are the Great Fire of London, and certain successes gained by the English fleet in the Dutch War, both happening in the year 1666; hence named by the poet "Annus Mirabilis." The poem consists of more than three hundred stanzas of four lines each, the lines being ten-syllabled lines rhyming alternately. This was a favourite metre in Dryden's day, but it is one that wearies the ear, and is peculiarly ill-suited for the purposes of narrative. Indeed, the "Annus Mirabilis" is, on the whole, one of the least pleasing of its author's works; and it is deformed by occasional examples of ingenious extravagance, showing that Dryden had not yet fully escaped the influence of the metaphysical style prevalent in his younger days.

The next class of Dryden's works which we have to consider are his satires; and in them we find his genius displayed in its highest excellence. The most important of these are of the nature of political satires, written in the interest of the King, and in favour of the Duke of York's succession to the throne, in opposition to the party which called itself the Protestant party, led by the ambitious and unscrupulous Earl of Shaftesbury, and whose nominal rallying-point was the unfortunate Duke of Monmouth, natural son of the King. The first and most successful of these satires is the first part of "Absalom and Achitophel." This work was published in 1681, and published with the view of producing a specific effect upon the public mind. The anti-Popish feeling of the country was very strong. It had shown itself especially in the horrible cruelties, the murders of innocent men in the name of justice, which arose out of the so-called Popish Plot—a plot which was mainly, at all events, the creation of popular alarm and excitement deliberately stimulated by the party of Shaftesbury for their own selfish end. And the friends of genuine liberty, alarmed at the violence of the King, were to a great extent driven to support Shaftesbury. But the tide had somewhat begun to turn; and Shaftesbury himself was in the Tower under a charge of treason. At this juncture Dryden produced his satire in the hope of exciting popular ill-will against him, and so securing his ruin. Under the guise of the Scriptural story of David and his rebellious son, Absalom, he presents to us the history of the moment. The too indulgent David is the King himself. Absalom stands for the beautiful, weak, and ungrateful Monmouth; Achitophel, the crafty and faithless counsellor, for Shaftesbury; while the minor characters of the Scripture story have all their counterparts in the modern history. The satire is one of the finest in the language; its peculiar merit consists in the extraordinarily powerful portraits it contains of the chief characters.

This satire was a great success, and its fame immediate. But Shaftesbury, nevertheless, escaped, for the grand jury of London rejected the indictment against him; and his admirers struck and distributed a medal in honour of the event. This gave occasion to another satire from the pen of the Court poet. "The Medal" is scarcely less powerful than its predecessor, but it is very different in tone and manner. The cool dissection of character which we find in "Absalom and Achitophel" is replaced by violent, even savage attack. It is an onslaught upon Shaftesbury alone.

A second part of "Absalom and Achitophel" was published the next year; it is not, however, for the most part the work of Dryden, but of a very inferior hand, and has little of the power of the first part.

"MacFlecknoe" is a satire of a very different class. Dryden, like most of the wits of his day, as well as of the periods which preceded and ultimately followed his time, was always in the heat of controversy, and always at war with rival writers and literary men. In "MacFlecknoe" he intended to inflict summary vengeance upon Shadwell, a second-rate poet, with whom Dryden was constantly at war. The satire is very brilliant, very severe, and very unjust.

The next class of Dryden's writings of which we have to speak consists of his poems on controversial subjects. Of these the most important two are the "Religio Laici," written by Dryden while still a Protestant, in defence of the Anglican Church; and "The Hind and the Panther," written after his conversion to the Roman Catholic religion, in defence of the Church of Rome. The first of these poems, in the form of an epistle, contains an elaborate argument in favour of the author's then position. In point of expression, and the admirable adaptation of style and versification to the subject-matter, it is almost without a rival among poems of its class. The effect of "The Hind and the Panther" is rather spoiled, notwithstanding its many beauties, by its half-allegorical form.

A very high place among Dryden's poems must be awarded to his odes. Of all the lyrics in our language of the more ambitious, the heroic or Pindaric kind, Dryden's great ode on "Alexander's Feast" is the finest. It was written in the year 1697, and, like his "Ode for St. Cecilia's Day," and some other well-known odes by other authors, was written for the musical festival then annually held on St. Cecilia's Day. Dryden's extraordinary energy and vigour of style was precisely suited for such poetry, while his deficiency in pathos was not felt, for in the Pindaric ode there is little space for pathos.

Dryden's "Fables," many of which are from Chaucer, are either adaptations in modern language of some of the "Canterbury Tales," or original tales in imitation of Chaucer. As poems they are pleasing; but they are not Chaucer either in spirit or in style.

Dryden's translations consist of the whole of Vergil, several of the Satires of Juvenal, and some of Ovid's Epistles. His prose works are entirely critical, the most important being an "Essay on Dramatic Poetry." They are distinguished for the most part by admirable good sense and judgment in their criticism, and always by a style manly and vigorous, the counterpart in prose of Dryden's manner in verse.

Of poets other than dramatic, there is none but Dryden, in the age of the Restoration, worthy of any prolonged notice. Poetry was the fashion; and dilettanti noblemen in numbers wrote poetry to which their rank gave a momentary prominence. To this class belonged Roscommon, Rochester, Buckingham, and also Dorset. Some, like Sir Charles Sedley, wrote graceful and lively songs. Perhaps the poem best worthy of mention is the "Splendid Shilling," by John Philips, a mock-heroic poem not destitute of humour.

THE DRAMATISTS AND PROSE WRITERS.

Turning to the drama, in tragedy the highest place must be assigned to the unfortunate Otway. Thomas Otway was a man of good birth and education, but his career, varied as it was in its incidents, was one unbroken succession of misfortunes and distresses, and he died at last in the most abject want and misery in 1685, when only thirty-four years of age. The best of his tragedies, and those upon which his fame now exclusively rests, are *The Orphans* and *Venice Preserved.* These plays show that Otway possessed the power of pathos, and the power of moving our sympathies, in a very rare degree. His conceptions of character are powerful, if not always very natural, and his style is vigorous and elevated. In his comedies, of which he left a considerable number, Otway's genius shows to far less advantage. His true domain was tragedy, and tragedy of the saddest and most pathetic kind.

Nathaniel Lee was also a writer of much tragic power, though through all his plays there runs a vein of a kind of strange wildness, which may be explained by the tendency to insanity which on more than one occasion during his life became developed into actual madness. The best known of his pieces is *The Rival Queens; or, Alexander the Great.*

Thomas Southerne and Nicholas Rowe may be conveniently mentioned here as belonging to the same dramatic school with those of whom we have spoken, though both of them in the more active period of their lives were contemporaries rather of Pope than of Dryden. Few plays appear to have enjoyed a more genuine popularity than Southerne's tragedy of *Oroonoko.* Rowe was one of the most prominent of the men of letters of his time; he edited the plays of Shakespeare, and filled the office of Poet Laureate. Of his plays the most successful were *Jane Shore* and *The Fair Penitent*, the latter of which is founded upon Massinger's *Fatal Dowry.*

Far more characteristic, however, than its tragic stage is the comic drama of the Restoration. It is in it far more than in any other branch of literature that we find the whole spirit and temper of the Restoration reflected—its lightness and gaiety, its utter want of earnestness or serious purpose, its licentiousness, its rebellion against all rules savouring of Puritan austerity, its foreign tastes and sympathies. Its immorality is not like that which we find in so many of the Elizabethan comedies—that grossness of thought and expression, that coarse animalism which always belong to an age of great force and energy, but little refinement. The immorality of the Restoration drama lies far deeper, and indicates a very different tone and spirit in society. It is the immorality of an age and class which knows no object worthy of pursuit but pleasure, which not only ignores but despises every higher principle, every noble end, and every more serious or earnest pursuit. This is a spirit which has seldom been at all prevalent in English society. And this has gone far to prevent the comedies of the Restoration retaining with posterity anything like the favour which they enjoyed in their own day; and in the present day its sheer indecency prevents its reproduction on the stage. But we should convey a very false impression if we led our readers to suppose that the dramatists of the Restoration owed their success to their immorality or their frivolity. In their faults they reflected the world they lived in. Their genius was their own, and the greatest among them were men of rare comic genius. The plays are full of the most humorous delineations of character, are inexhaustible in variety of amusing intrigues and incident, and sparkle with the highest wit.

The school of dramatists of which we are now speaking first became prominent immediately after the Restoration, and was distinctly its product, and for this reason we speak of it as belonging to this period. But it must be remembered that several of these dramatists, including the most distinguished of them all, lived to see the final fall of the House of Stuart and the accession of William III. The earliest of the dramatists of this class was Sir George Etherege, a man who presented a fair type of the cavalier in the days of his prosperity. His comedies are amusing, but their fame was soon quite eclipsed by his more distinguished successors.

William Wycherley was born in 1640, of a good family. He was educated in France, and returned to England when the exiled cavaliers were returning to enjoy their triumph there after the Restoration. He soon became the most popular of dramatists, though by no means the most prolific. Nor was he less successful in society than on the stage, his brilliant wit, courtly manners, and handsome person securing him an enviable position at the gay Court of Charles II. But with him, as with most others of his type, Court favour proved uncertain and pleasure passed with youth; he fell into poverty, purchased his release from want of James II. at the usual price, by turning Roman Catholic in obedience to the royal command, and died in obscurity. His plays show in a very high degree that resource and fertility of invention, that brilliancy and brightness which are characteristic of the class of dramatists to which he belonged; but in point of morality nothing can be more debased. He has been not unfairly described as "the most licentious and hard-hearted of a singularly licentious and hard-hearted school." The best of his plays are *The Country Wife* and *The Plain Dealer.*

Sir John Vanbrugh was born in 1666, being the son of a wealthy sugar-baker in London. The family was originally Dutch, and was one of the many which settled in England during the persecution of the Protestants under the Duke of Alva. Of Vanbrugh's education and early life very little is known; but he seems to have served for some time as a soldier abroad. In later life he held positions of some dignity in the Heralds' College, and for his services of this nature was knighted by George I. But his real fame rests upon his distinction in the two arts of architecture and the drama. As an architect he acquired the highest reputation, though his productions, of which Blenheim Palace is the most important, have been very variously judged by modern critics. As a comic dramatist his merits are very great. His characters are drawn with singular freshness and clearness, and the conduct of his plots is admirable. Of his five comedies the best known is perhaps *The Provoked Wife.* Living as Vanbrugh did, later than Wycherley, and writing under the more wholesome influences prevalent after the Revolution of 1688, his plays, at least the later ones, are by no means so grossly immoral as those of his predecessor. Vanbrugh died in 1726.

George Farquhar was born at Londonderry in

1678. He became an actor; then left the stage and served in the army; and finally returned to the stage, and became eminent as a comic dramatist. His plays are chiefly distinguished by the variety and truth to nature of the characters which they introduce, and the touches of humour which constantly recur in the course of them. The most popular of his pieces is *The Beau's Stratagem.* Farquhar died early, in great want, in 1707.

The most eminent, however, of the comic dramatists of this period was William Congreve. He was born in Ireland, though of English parents, in 1670. He received his education at Trinity College, and it is evident that he enjoyed a far more systematic training than most of his brother dramatists. He early settled in London; and his qualities being exactly such as best justified him for social and literary success in the period at which he lived, he very soon acquired a leading position among the wits, authors, and men of fashion of the day. Few men have been so uniformly successful as Congreve. In his early youth his criticism was respectfully sought by Dryden, then in the very zenith of his fame. In later life he was honoured by Pope with the dedication to him of his "Homer." Among the wits Congreve was supreme; in fashionable society he was irresistible. He was always prosperous in his circumstances, always enjoyed comfortable appointments under the State, and among the comic dramatists he was the acknowledged leader. His plots are not as carefully or skilfully constructed as those of many of his contemporaries; but his characters are admirably portrayed, and if not as fresh are at least as lifelike as those of any of the comic dramatists. The qualities, however, in which he stands supreme are the brilliancy of his dialogue, his mastery of language, and the unfailing flow of his wit. The best of Congreve's plays are *The Old Bachelor* and *Love for Love.* Congreve lived till 1729, but he had retired from the dramatic art many years before his death. In his own day Congreve was not less famous as a tragic writer and as a poet than on the comic stage; but his somewhat pompous and artificial tragic style has little charm for modern readers.

Few men of his age played a more prominent part in the history of his country than Edward Hyde, Earl of Clarendon. As a member of the House of Commons, he bore his share in the contests between the King and the Commons in the Long Parliament. He was at first a supporter, though a moderate one, of the popular cause; but he ultimately joined the King, and after the death of Charles I. he became the faithful friend and counsellor of his son, afterwards Charles II., sharing his long years of exile, and undergoing with him all the trials and privations of those gloomy years for the Royalist party. Hyde returned with his master from exile, became Lord Chancellor and Earl of Clarendon, and for some years was one of the most influential and probably the wisest of the King's advisers. His daughter married the Duke of York, afterwards James II., and he thus became father-in-law of one king, and grandfather of two successive queens. But Clarendon's favour with the King declined, while his unpopularity with the people increased, and, being impeached, he chose to resign himself to voluntary exile, and passed the remainder of his life abroad. He died in 1674.

In the history of English literature Clarendon is entitled to a high place in virtue of his "History of the Great Rebellion." Histories may generally be divided into two classes. There are histories written by eye-witnesses, who describe what they themselves have seen and known; these, for the most part, derive their whole value from the personal knowledge of the writer, and have seldom any claim to philosophical or literary merit. There are histories written by men of philosophical mind, of calm impartiality, judgment, and discernment, and with the graces of literary style. But it is one of the rarest things in the history of literature to find the merits of these two kinds of history combined, as they are in a very high degree in Clarendon's history. He writes of the events of his own times, events all occurring under his own eyes, and in which he himself took an active part. But, though his history is undoubtedly very partial, he yet writes also with much of that calm judgment upon men and things, and that insight into character, which belong to the philosophical historian; and his style, though not a model of English writing, is manly and dignified.

Izaak Walton was born in 1593. He passed the active years of his life in the exercise of the trade of a linendraper in London; but having at a comparatively early age acquired a moderate competence, he retired from business, and passed the last forty years of his long life in retirement in the country, enjoying the society of his many accomplished friends, his books, and his fishing. He died in 1683. His works are his "Lives," and his treatise on fishing, "The Complete Angler." The lives which he wrote are those of Donne, the celebrated satirist and Dean of St. Paul's, Sir Henry Wotton, Hooker, George Herbert, and Bishop Sanderson. Few books in the language are more attractive than these exquisitely written biographies. "The Complete Angler" is a book unlike any other ever written. It is, like its author, a quaint mixture of ardent enthusiasm on the one subject of angling, with great delicacy of taste, love of nature, keen observation, and a loving tenderness of spirit. The style and language, in their quaint simplicity, are quite in keeping with the subject.

But of the prose writers of this age none is comparable in genius with Bunyan. John Bunyan was born in 1628. He was born in the very lowest rank of society, for his father was a tinker, and he himself in early life followed the same trade. Bunyan therefore enjoyed as scanty opportunities of education as it is possible to imagine; no great writer indeed ever owed less to external aids than he did. For some years he served in the army, probably of the king, during the Civil War; but having received strong religious convictions, he abandoned the army and became a preacher, attaching himself to the sect of the Baptists. He pursued his mission with that zeal and devoutness which showed themselves in all he did, and became singularly powerful and popular as a preacher; but the Restoration, and the persecution of all Dissenters which followed it, interrupted his career. He was thrown into Bedford gaol for the offence of preaching and praying in his own way, and there spent no less than twelve years At the end of that time he was released, and resumed his old calling of a preacher. He died in 1688. Besides numerous tracts and other less important treatises, Bunyan was the author of three remarkable works. His "Grace Abounding in the Chief of Sinners" is a confession or autobiography, a history of the changes in his own heart and life through which he was led from the state which he afterwards portrayed under the image of the City of Destruction to that in which we see him in his later life. As a history of a great and notable character, told with perfect candour and wonderful power, it is a book of supreme interest.

But Bunyan's greatest work is the "Pilgrim's Progress." Probably no book in the English language, certainly no prose work, has ever had anything like the same kind and degree of popularity with this. For all classes and ages, during two centuries, wherever the English language is spoken, this book has been found to have an irresistible charm. And it owes its power not to the peculiar religious views of its author—for when read with care it will be found very unsectarian—nor to the ingenuity of the allegory, though this is very great. Its special power lies in the breadth, simplicity, and directness of its teaching, and, above all, in the force of genius which pervades every page of it, showing itself now in portraying the anguish and conflict of the human heart, now in the keen appreciation and sweetest description of the loveliness of nature, now in passages of infinite tenderness and pathos. Allegory though it be, there are few stories which, merely as stories, have anything like the absorbing interest of the "Pilgrim's Progress." Its style is perfect in its purity and simplicity.

The "Holy War" is an allegory of something the same class as the "Pilgrim's Progress," but is much inferior in power and interest.

HEAT.—IV.

[*Continued from p.* 213.]

CONDUCTION OF HEAT (*continued*).

THAT important invention, the safety-lamp, depends for its action on the conducting power of the metals. The lamp is entirely surrounded by a shade composed of wire gauze. As the flame attempts to pass through the gauze, its heat is conducted away, and it is no longer able to ignite the explosive gases outside.

The mode in which the metal conducts the heat away will be easily seen by taking a cylinder, one end of which, A (Fig. 27), is composed of wood, while the other end is of metal. If now we wind a piece of paper round this, and hold it in the flame of a spirit-lamp, the paper over the wooden part will be charred, while that over the other end will merely be smoked, the metal underneath having conducted away the heat before it had time to scorch the paper. This also explains how a bullet may be melted in a piece of writing-paper. The paper must be wrapped smoothly round it, and the flame allowed to play only on the part in contact with the lead. The metal will, of course, burn through the paper as soon as it is melted, but up to this time the heat is all employed in melting the lead, and is thus kept away from the paper.

Fig. 27.

If we take a few flakes of solid carbonic acid, procured as described in our last lesson, and place them on the hand, they will not feel as cold as we should expect. The reason of this is that they become slowly converted into gas, which keeps them from absolute contact with the hand. If a little ether be mixed with them, and the mixture be dropped on the hand, intense cold will be produced, and all the effects of a severe burn will be experienced. If a lump of frozen mercury be taken up in the finger, exactly the same result will be produced. We see, then, that an intensely cold substance *burns* as an intensely hot one does. If a quantity of mercury be frozen, with a wire in it to serve as a handle, it may be lifted like a solid mass. Now dip it into a vessel of water, and in a short time it will begin to melt, drops of it falling to the bottom of the vessel. These, as they fall, will absorb so much heat as to freeze tubes in the water, down which the mercury will run.

When a heated body has to be handled, some non-conducting material is usually interposed between it and the hand, so as to guard against burns. Thus in most teapots an ivory ring is let into the handle, for the sake of keeping it cool. Many apparently strange phenomena may be explained in this way. A kettle, for instance, that has been used some time, and become coated with fur outside, may be taken off the fire and placed with impunity on the naked palm, even though the water be boiling in it. The fur is a non-conducting material, and protects the hand from the heat.

A red-hot poker likewise may be safely struck with the hand. This partly arises from the fact that a quick blow does not allow time for the metal to burn the hand, and partly from the fact that the moisture of the hand is converted into vapour, and prevents absolute contact with the heated iron. Some remarkable phenomena have been observed which illustrate this fact. If we take a silver vessel, and having raised it to a temperature a little above 212° F., immerse it in a vessel of water, it will hiss from the sudden conversion of the water into steam, and will speedily be cooled down. If, however, we heat the vessel to redness, and place it on the surface of water, no effect will at first be produced. It will quietly float for a time without any sound being heard. After a while, however, a cloud of steam will suddenly be produced, and the usual hissing noise will be heard. A similar thing occurs if a highly heated silver weight be dipped into a vessel of water.

The reason of these apparently strange phenomena is that as soon as the heated metal touches the water, that portion which is nearest to it becomes suddenly converted into steam, and this keeps the silver from contact with the water. A layer of vapour is, in fact, interposed, which prevents actual contact. When, however, the silver is cooled down nearly to the temperature of boiling water, the separation ceases to exist, and the water comes in contact with the silver and cools it.

These effects were first observed by Leidenfrost, but have since been carefully investigated by others. A simple way of showing them is to take a platinum or silver dish, and having placed a spirit-lamp under it so as to heat it to redness, drop with a pipe a little water into it. The liquid does not spread itself out and moisten the dish as it would at ordinary temperatures, but at once assumes a globular form, and rotates rapidly. Its evaporation, too, is very much less rapid than it would be if it boiled, and its temperature is always below the boiling point. The liquid is said to have assumed the *spheroidal state*, and will remain in this condition if the source of heat is kept under the dish. If, however, it be removed, the heat will gradually diminish, till it is no longer sufficient to maintain the globule in the spheroidal state, and then the liquid will touch the metal, and be immediately thrown into a state of violent ebullition, a large amount of steam being given off.

A remarkable experiment is sometimes tried which will illustrate this fact very clearly. The performer procures a large melting-pot containing several pounds of lead, and places it over a fire until the lead is not only melted, but quite red-hot. Having washed one hand so as to free it from grease, he dips it into a vessel containing strong liquor ammoniæ, and then plunges it into the molten metal, or ladles out the lead with it, without any danger. The only sensation produced is one of cold. This experiment is one which few have the courage to attempt, but it is perfectly safe. The heat of the metal evaporates the liquid and drives out the ammoniacal gas from it, and thus the hand is entirely enveloped in a glove of vapour, which prevents contact with the lead. The cold felt arises from the rapid evaporation. In performing this experiment it is very important to have the lead red-hot, as otherwise it may come in contact with the hand, and a severe burn is then produced.

CONVECTION.

After conduction, the next mode in which heat is transmitted is by *convection*, or the setting up of currents in the liquid or gas to be heated. By this means each particle in succession is directly exposed to the source of heat, and thus has its temperature raised.

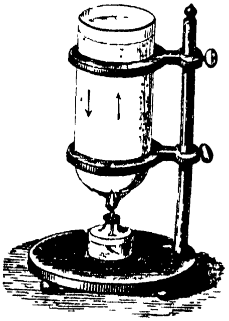

Fig. 28.

There are several ways in which convection may be illustrated—one of the best is to take a glass vessel filled with water (Fig. 28), and having dropped in a few fragments of litmus, cochineal, or permanganate of potash, place a spirit-lamp under it, and watch the liquid. A stream will begin to rise directly over the lamp, its course being clearly shown by the coloured particles. This stream will rise to the top of the vessel, where it will spread out and form a down current at the sides, and in this way all the liquid will in turn be exposed to the heat.

Another way in which this circulation may be shown is represented in Fig. 29. Two glass tubes are bent as there shown, the lower one being filled with coloured water; the other is filled with clear water, and is inverted into the funnel-shaped ends of the first. A spirit-lamp is now held to one side so as to warm the liquid there, and the coloured part of the liquid in that limb will at once begin to rise, and to descend in the other.

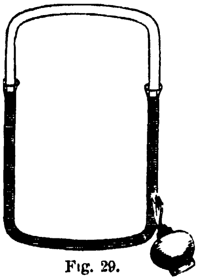

Fig. 29.

On this principle the hot-water apparatus frequently employed for warming large buildings is constructed (Fig. 30). A furnace and boiler are placed at the lower part of the building. From this a pipe, M, passes to a cistern, Q, at the top, provided with a safety-valve, *n;* and from it pipes lead to the stoves, *a*, *b*, *c*, *d*, *e*, *f*, in the various rooms. The water traverses these on its way back to the boiler, and gives up to them much of its heat. The water heated by the furnace becomes, of course, specifically lighter, and hence rises, while that which has been cooled by its passage through the pipes descends, and in this way a constant circulation is maintained.

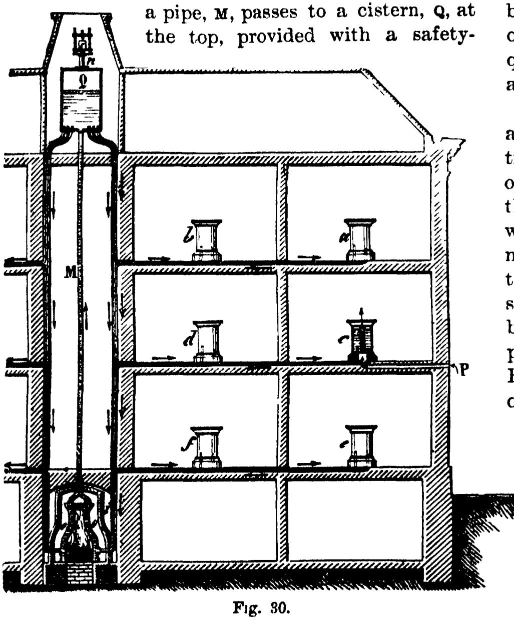

Fig. 30.

Gases as well as liquids are heated by convection. The trade-winds are grand natural illustrations of this fact: the air having become heated by contact with the surface of the earth in tropical regions, expands, and rises, making way for the currents of colder air from the temperate zones. In the higher regions of the atmosphere a current usually sets in the contrary direction to that on the earth's surface, and thus forms the return current. Land and sea breezes are further exemplifications of the same fact.

RADIATION.

The third way in which heat is communicated from one body to another is by means of *radiation.* In conduction and convection the particles of matter to be heated were brought into close contact with the source of heat: we shall now find, however, that heat can pass from one body to another without actual contact, and even without altering the temperature of the medium through which it passes. A striking illustration of the latter fact is seen in the experiment of setting light to various substances by condensing the sun's rays on them through a lens of ice. The heat passes through it in sufficient quantities to inflame the substances at its focus, and yet the ice is unmelted.

When we stand a little distance from a fire we at once experience a sensation of warmth; no particles of matter appear to pass, and yet the influence of the fire is felt. Rays of heat are given off by the burning fuel, which create in us the feeling of warmth. The presence of the air is evidently not necessary for their passage, since we experience the heat of the sun, whose rays must pass through space. We may also prove this fact experimentally by letting two charcoal points connected with a powerful battery touch under an exhausted receiver. Rays of heat will be given off despite the absence of the air, and their presence will at once be felt.

RADIANT HEAT AND LIGHT COMPARABLE.

Now we find that radiant heat obeys the same laws as light does, the rays being given off in all directions, and, in a uniform medium, always travelling in straight lines. This may easily be shown by suspending a heated body in the air, and then holding a thermo-electric pile at equal distances on each side of it. If, however, a plate of metal be interposed between the pile and the source of heat, the rays will at once be intercepted, and the needle will return to zero. The power of radiant heat diminishes, as in the case of light, inversely with the square of the distance. (*See* lessons on Light, Vol. VII., p. 178).

If we take a heated body, such as a cubical vessel, M, filled with boiling water (Fig. 31), and place it in front of a concave mirror, we shall find that the rays of heat are reflected from its surface, in the same way as those of light are. Let a differential thermometer be placed in the focus of the mirror, a screen, A, being placed so as to keep off the direct rays from M. The indicating bubble will at once show the increase of temperature; if the bulb be moved at all out of the focus, the bubble will return to its place, clearly showing that the rays have been reflected and brought to a focus. By means of a small mirror we can easily prove that in the case of reflected heat the angle of incidence is always equal to the angle of reflection. An ordinary sheet of tin held in front of a fire will illustrate this reflection of heat, and from it we shall understand the use of reflectors in roasting. As the amount of heat reflected depends upon the brightness of the reflectors, the necessity of keeping them clean and bright will be apparent.

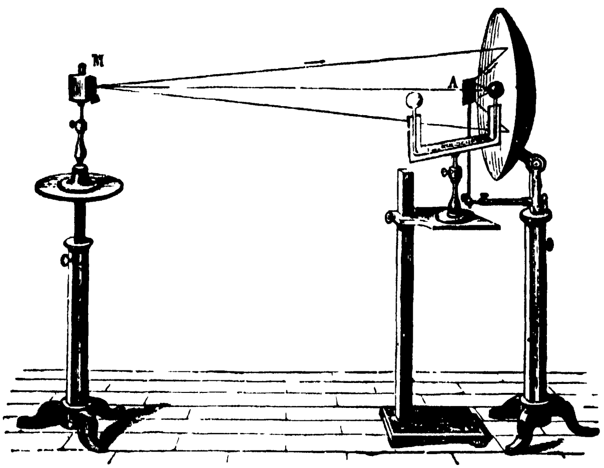

Fig. 31.

Rays of heat may be refracted as well as reflected. When a beam from an electric lamp is caused to fall upon a prism, the luminous rays are bent out of their course, and resolved into the prismatic colours; the heat rays are likewise diverted; and if we place behind the spectrum a metal screen with a narrow slit in it, so as only to allow the rays from one part of the spectrum to pass at a time, we may, by a thermo-electric pile, test the heat of different parts. In doing so we find that at the violet end of the spectrum there is but little heat; even in the yellow, though that is the most luminous part, there is not much. At the red portion the heat is greater, but its intensity is greatest when the pile is moved altogether beyond the visible spectrum, so that the most intense portion of the heat is altogether non-luminous. The thermal spectrum, in fact, overlaps the visible one.

DIFFERENCES OF RADIATIVE POWER.

When we commence to try experiments on the radiation of heat, we soon find that different surfaces possess different powers of throwing off rays of heat. This is easily shown by means of a "Leslie" cube (Fig. 32), which consists simply of a tin or pewter cube with an opening on one side, by which it can be filled with boiling water. One side may be covered with a layer of gold-leaf, another with glass, a third with lamp-black, while the fourth is left blank. Each side is now turned in succession towards the thermo-electric pile, and the exact deflection of the needle is noted. Other substances may then be laid on the sides of the cube, and in this way a table showing the radiating power of different bodies may be drawn up.

When the gilded face is towards the pile, little effect will be produced; if the pewter be a little tarnished, a greater deflection will be produced when that side is turned to the pile. When the glass side is presented, the intensity will be much more, while with the lamp-black it will be most of all. As lamp-black is the best radiator, its power is represented by 100, and then the power of gold and other brilliant metals will be between 12 and 15.

Another way in which we may show these different powers of radiation is to observe the time which water takes to cool when placed in different vessels. Take, for example, two similar cubes, and let one be covered with lamp-black while the other is left bright. Fill both with boiling water, and after some time test the temperature of each. That coated with lamp-black will be found several degrees cooler than the other. It has radiated heat more rapidly, and hence has lost a larger amount.

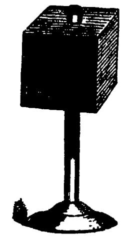

Fig. 32.

If we substitute a lump of ice or a cube of ice-cold water for the vessel M (Fig. 31), and place the thermometer as before, it will fall, and thus indicate an apparent radiation of cold. This is only apparent, however; both the ice and the thermometer possess a certain amount of heat, which they radiate. The thermometer, however, being at a higher temperature, throws off more intense rays, and hence, as it parts with more heat than it receives, its temperature falls. The chill felt when standing near a cold surface may be similarly explained.

When the rays of heat fall upon any substance, they are divided into three parts. One portion is reflected from the surface, according to the laws already mentioned; a second part is irregularly scattered, and is known as *diffused heat.* This corresponds to the light which is irregularly reflected from any substance, and renders it visible. The third portion is absorbed by the substance, and raises its temperature. When a number of surfaces are exposed thus to the rays from a heated body, their absorbing powers will be found to differ very greatly, in some cases nearly all the heat being absorbed, while in others by far the greater portion is reflected. These two amounts will, as a rule, be inversely proportional, the best reflectors being the worst absorbers, and *vice versâ.*

GOOD ABSORBERS GOOD RADIATORS.

The absorbing power, likewise, is just equal to the radiating power; they appear to be, in fact, almost synonymous terms. The difference caused in the absorbing power by the nature of the surface may easily be shown. Let the beam of an electric lamp fall upon the clean bulb of a differential thermometer; the rays, as they have already passed through the glass lenses and through a stratum of air, will impart no heat to the thermometer, which will remain unaffected. If now we lay a little lamp-black on the bulb, the heat will at once be absorbed, and the bubble driven to the other limb.

Many common practices can easily be explained by noticing the different absorbing and radiating powers of various substances. A dish-cover or metal teapot is kept as bright as possible, so as to prevent the escape of the heat by radiation; a black earthenware teapot, on the other hand, has a dull and dark surface, so that it may be placed on the hob and absorb the heat. So, too, if a kettle is to heat quickly, the part exposed to the fire should be covered with fur and soot, to absorb the heat; the other part should be bright, to prevent its radiation. These things, like many similar ones, were known and put into practice long before their true causes were known, but science now shows us how to account for them.

The laws of radiation likewise account for the deposition of dew at night. The air is then cooler than the surface of the earth, and the latter accordingly radiates its heat into space. Those bodies, therefore, which are the best radiators become cool most rapidly, and therefore condense the vapour which exists in the air. Plants radiate freely, and hence become coated with dew, while a smooth road remains almost dry.

Clouds, to a great extent, prevent this radiation, and hence the dew will be most plentiful on a clear and cloudless night. A very thin layer of calico or matting is likewise sufficient to retard radiation, and for this reason gardeners often place a covering of this kind over delicate plants to protect them from injury by the cold. When the temperature of the ground is very low the dew freezes as it is deposited, and constitutes hoar-frost.

TRANSMISSION OF RADIANT HEAT.

When experimenting with radiant heat, we find, as already referred to, that substances differ greatly in the amount of heat they allow to pass through them. This may easily be tested by the arrangement shown in Fig. 33. A screen, B, is interposed between the source of heat, A, and the thermo-electric pile, D; all stray rays are thus cut off, and only those which pass in a straight line through the aperture C can reach the pile. Under C is a small shelf, on which we can place the bodies to be tested. A glass cell filled with bisulphide of carbon, and placed there, will allow about 63 per cent. of the rays to pass, while, if filled with water, it will only allow 11 per cent.; other liquids may also be tried.

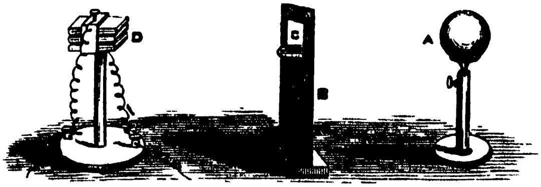

Fig. 33.

Among solids, rock-salt is the substance most transparent to heat, as it allows about 92 per cent. of the rays to pass. With most substances the amount of heat transmitted varies with the nature of the source of heat, the heat from a coil of incandescent platinum wire, for instance, having a greater penetrating power than that from a plate of copper at 750°.

We must, however, leave the student to pursue these studies further, the object of these lessons—to give a general insight into the main facts of the science of Heat—having been accomplished. With what we have here dealt with he will be able to account for many of the ordinary phenomena he meets with in every-day life. and where no explanation satisfactorily suggests itself new lines of inquiry will arise which will require the aid of more advanced works on the subject. Given the spirit of inquiry thus called forth he may eventually explore the whole domain of heat.

ARCHITECTURE—XIV.

[*Continued from p.* 202.]

THE ENGLISH RENAISSANCE (*continued*)

THE versatility of Wren's genius is nowhere better shown than in the numerous churches which he was called upon to build in the City; there are at least thirty of them, and no two of them are quite similar. The sites given him were sometimes small and irregular, but he seems to have been able in all cases to suggest an arrangement which should accord with the requirements of the church and yet be dignified in design. The vaults which he threw over the interiors are unfortunately for the most part in lath and plaster, but their forms are based on those of the Roman *thermae*, or baths—domes and semidomes, octagons, barrel-vaults and intersecting vaults of every description, always presenting the solution of the problem in a new way and giving a variety of effect which is generally pleasing. Where he fails is in the quality of the detail, which must in many cases have been left to the sculptors and plasterers who worked under his control, and the vernacular style of the period was not of a very high standard in that material. In those works where stone was employed, as in St. Paul's, there is a vigour in the mouldings and detail which in contrast with later work was remarkably pure in design. One of his most successful interiors is the church of St Stephen, Walbrook, a design in which the dome forms virtually the body of the church. Wren also may be said to have been the originator of a type of tower and spire which, based on Gothic design, is worked out with classic details. The steeples of Bow Church, St Bride's, Fleet Street, St Dunstan in the East, St. Michael's, Cornhill, and St. Magnus's Church, London Bridge, all show various methods of dealing with this feature, and they constitute now the most picturesque features of the City.

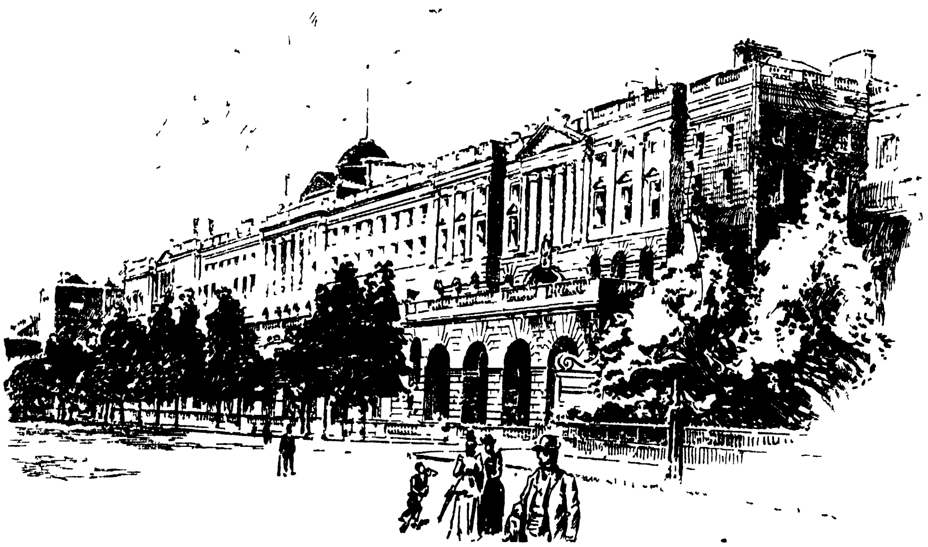

Fig. 51.—SOMERSET HOUSE.

One of Wren's earliest secular works was the Sheldonian Theatre at Oxford, in the roof of which (80 feet in span) he showed the resources of his constructive genius. He made additions to Hampton Court Palace, and was the architect of Chelsea Hospital and of portions of Greenwich Hospital; to him we owe the Library of Trinity College and the second-court of St. John's College, Cambridge.

Although not a Gothic architect, he was called upon to complete the western towers of Westminster Abbey, in which at least he knew how to group their design so that, without examination of the detail, they group harmoniously with the rest of the structure; and in Tom Tower, Oxford, built over the archway of Cardinal Wolsey's work, he designed a crowning feature which might well be taken for a part of the original design. Wren was succeeded in his practice by Hawksmoor, his favourite pupil,

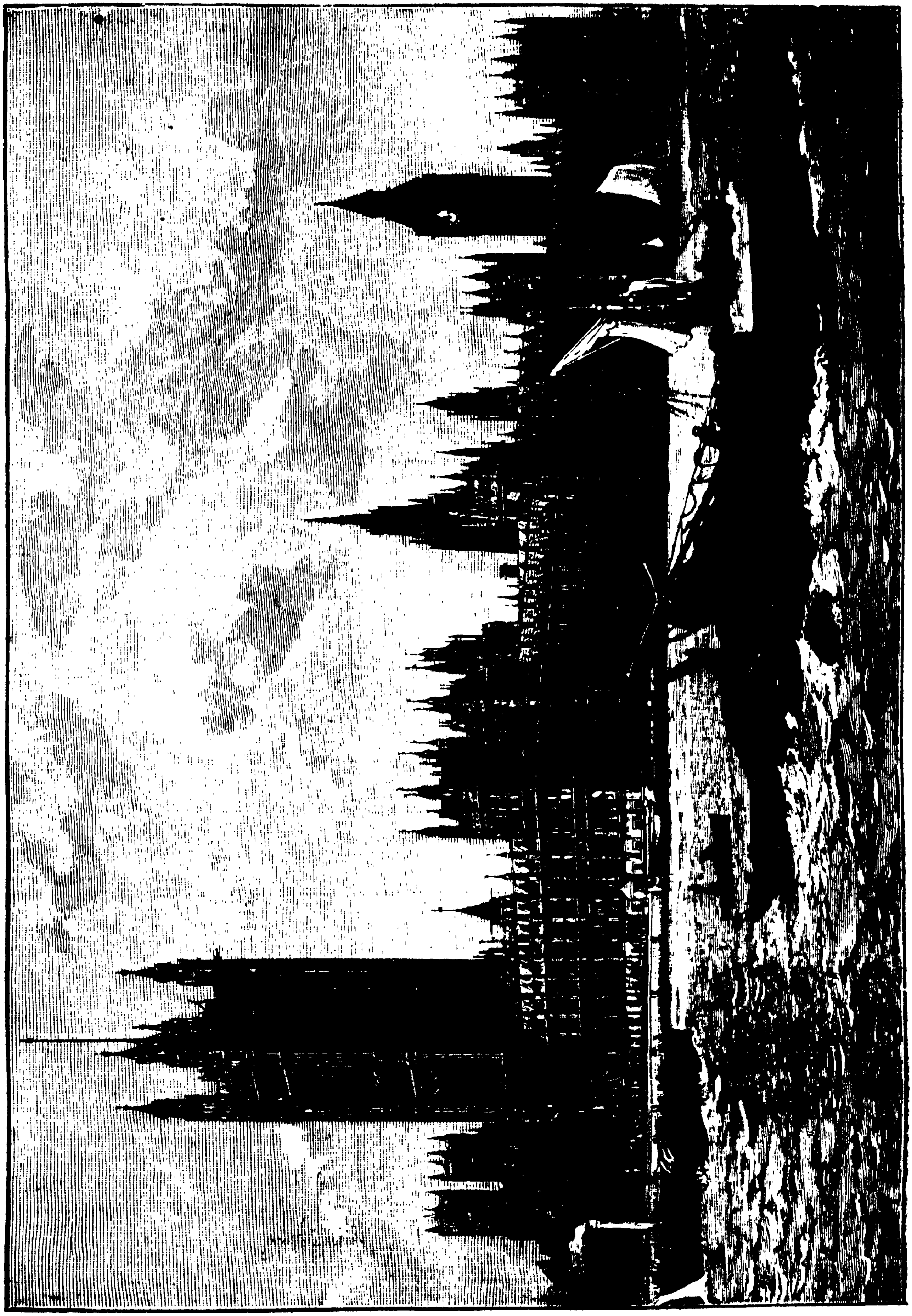

Fig. 52.—The Houses of Parliament. (*From a Photograph by Frith & Co., Reigate.*)

and by Sir John Vanbrugh. To the former we owe the church of St. George's, Bloomsbury, a building with a fine portico of Corinthian columns, and a tower surmounted by a pyramidal-stepped spire, in imitation of Pliny's description of the mausoleum of Halicarnassus. He also built St. Mary's Woolnoth, Lombard Street, and the church of St. George's-in-the-East.

Sir John Vanbrugh's chief works were palaces, of which Castle Howard and Blenheim were the principal examples; in the latter the plan is very grandiose in its design, the exterior is heavy and badly composed. He employed the same gigantic order as Michael Angelo, but without the same knowledge of proportion and detail. The same feature is introduced in the central block of Castle Howard rising through two storeys. In comparison with this palace, the front of Wanstead House, by Colin Campbell, compares favourably. Here, there is the same gigantic portico in the centre, but the rest of the building is freed from pilaster decoration, the windows above giving the chief features of the upper storey over a ground storey with rusticated masonry. Colin Campbell, in conjunction with the Earl of Burlington, was the architect of Burlington House, portion of which now forms the entrance to the Royal Academy.

The next architect of note was James Gibbs, who in the commencement of the eighteenth century built the church of St. Martin's-in-the-Fields and at Oxford the circular building known as the Radcliffe Library, one of the most original and best designed buildings of the Italian style in England. His church of St. Mary-le-Strand is still fortunately one of the chief ornaments of the Metropolis.

Sir William Chambers, the architect of Somerset House in the Strand, both in the Strand and river fronts produced a work which compares most favourably with the finest works of the Italian masters; and Dance, in Newgate Prison, conceived a design which is unmistakable in the character of its destination, and therefore of high merit.

This brings our history virtually down to the end of last century. The nineteenth century commenced with a revival of Roman work, chiefly due to the publications of the Brothers Adam and to Dawkin's and Woods' "Palmyra and Baalbec," and the interest which those magnificent works awakened. It was followed by a Greek revival, caused by the attraction felt by the educated classes in the work of the Dilettanti Society and the acquisition through Lord Elgin of the sculptures of the Parthenon. To this succeeded about 1820 a Gothic revival, of which Welby Pugin was the chief inspirer, and Sir Gilbert Scott, William Burges, and G. A. Street the chief exponents. Though principally confined to ecclesiastical work, its influence extended to monumental and domestic architecture, as in the New Houses of Parliament (1840), and the New Law Courts in the Strand (1876) which may be looked upon as its final outcome. During the last few years a second revival of the early phases of the Renaissance style has crept in, and though nominally based on the simple type of "Queen Anne" brick architecture, it has sought for its models:—1st, the brick buildings of the Low Countries and North Germany, and, 2nd, the purer early work of the Cinque-cento period in Italy and the "Francis I." development in France; to this probably, in a few years, when more of it is known, will succeed some of the examples of the Plateresque work in Spain.

TERMS USED IN COMMERCE.—II.

(*Continued from p.* 234.)

Circular Note.—A note or bill issued by bankers for the convenience of travellers, affording a choice of various places for obtaining its payment.

Circulating Medium. — The authorised or recognised means of making payments in a country.

Circulation of a Bank.—The amount of licensed issue of its own notes payable to bearer on demand.

Clearing a Vessel.—Entering a ship's name and particulars of her cargo at the Custom House preparatory to her leaving port.

Clearing in Banking.—A plan adopted by the general body of London bankers for a daily exchange of cheques and bills at a house in Lombard Street, called the *Clearing House.* A clerk from each establishment attends twice a day with the cheques and bills he may have on the others, and distributes them in drawers allotted to the several banks. They then make out balance-sheets, entering on the Dr. side the sum each bank owes them, and on the Cr. side the sum they owe each bank. Those who have money to receive on balance take it indiscriminately from those who have to pay, as it is evident the sums to be paid must, in the aggregate, equal the sums to be received.

Cocket.—A warrant from the Custom House, certifying that the goods therein named have been entered, and are either duty free, or that the duty on them has been paid.

Collateral Security.—A secondary or indirect security for the fulfilment of a contract, or for money lent.

Commission. — An allowance or percentage made to agents for buying or selling goods, or for negotiating business of any kind.

Commissionaire.—A member of a body of disabled soldiers, enrolled to furnish the public with trustworthy messengers.

Commissioners in Bankruptcy. — Persons appointed to adjudicate in the Court of Bankruptcy.

Company.—A number of persons associated together in one common interest, and for the carrying out of any trade or course of operations. Also applied to the members of a firm not named in its signature, as "Smith Bros. & *Co.*"

Composition.—The settlement of the debts of a bankrupt by payment in part.

Compounding, or Compromising with Creditors.—Debtors paying a portion of the claims of their creditors by way of *composition*, on the latter, by agreement, giving an acquittance for the whole.

Compound Interest.—Interest paid not only upon the money lent, but on the interest which from time to time becomes due to the lender and is not paid.

Concession.—A grant of certain privileges made by the Government of a country to any person or firm undertaking to carry out undertakings affecting the public interest. The parties obtaining such concessions are termed *Concessionaires*.

Consignment.—A parcel or quantity of merchandise sent (generally abroad) for sale, or to be delivered, as the sender may direct. The person sending is termed the *Consignor*, and the person to whom they are sent the *Consignee*.

Consul.—A public official stationed in a foreign country to watch over the interests of the one he represents, and of its subjects located there.

Consul's Certificate.—A certificate granted by a consul, of the quantity and value of any merchandise sent to the country he represents. It is given on faith of the oath of the *Consignor*, and acts as a voucher to the Custom House of the port to which the goods are consigned.

Contingencies.—Liabilities likely to arise, but which cannot be exactly determined.

Continuation, or Contango.—The additional price or rate of interest paid for an extension of time by speculators on the Stock Exchange, who have purchased stock or shares on credit.

Contra.—A Latin word used in accounts, signifying *against* or *on the other side*.

Contraband.—A term applied to goods imported or exported against the laws of the land, or without complying with its conditions.

Contract.—A verbal or written agreement between two or more persons, which binds them to certain relative specified acts.

Contractor.—A capitalist or person who binds himself to others to effect certain works, or to supply certain quantities of goods or materials upon specified terms and conditions.

Coupons.—Small printed warrants for interest, attached to bonds for the purpose of being cut off and presented as each payment becomes due.

Course of Exchange.—The current rates for exchanging the money of one country for that of others, as applicable to bills.

Credit.—A term expressive of trust or confidence, and used when property is supplied upon the understanding of payment at a future period. It is also applied to the commercial standing and position of persons who, as the case may be, are said to be in *good* or *bad credit*.

Creditor.—One to whom money is due.

Currency.—The money of, or that which passes for money in, a country.

Customs Duties.—Duties levied (as a means of revenue to a country) on the importation or exportation of goods.

Days of Grace.—The number of days allowed beyond the expressed terms of a bill before payment can be legally demanded. They vary much in different parts of the world, but in the United Kingdom and the United States three days are allowed upon all bills, except those payable on demand or at sight. The following are the number of days allowed at the respective places named :—

Amsterdam	6	Lisbon and Oporto — Local	15
Antwerp	6	Lisbon and Oporto — Foreign	6
Altona	6	Madrid	14
Bahia	15	Malta	18
Barcelona	14	Milan	6
Berlin	3	Naples	3
Bilboa	14	New York	8
Bordeaux	10	Oporto	6
Bremen	8	Paris and the whole of France	10
Cadiz	6		
Dantzic	18	Rio de Janeiro	6
Frankfort-on-the-Main	4	Rotterdam	6
Geneva	5	St. Petersburg — after date	10
Genoa	30	St. Petersburg — at sight	3
Gibraltar	14	Trieste	3
Hamburg	12	Venice	6
		Vienna	8

Dead or Impersonal Accounts.—Accounts not dealing with persons but with things, such as *Bad Debts Account*, *Profit and Loss Account*, etc.

Debenture.—A Custom House certificate entitling the exporter of imported goods to a drawback of the duty originally paid on importation.

Debentures.—Deeds by which a company mortgages its property for borrowed money; the condition being that the holder has a right to seize the property if he be not repaid at the stipulated time, or in the event of default in any of the conditions of the deed.

Debit.—An entry on the Dr. side of an account.

Debtor.—One who owes money.

Declaration of Trust.—A written affirmation of confidence in the person in whose hands is placed the management and control of an estate or business.

Del Credere Commission.—An extra commission paid to an agent for guaranteeing the payment of an account which he has been the means of opening.

Demurrage.—Compensation paid to the owners by the charterers or freighters of ships, for their detention beyond a stipulated time.

Dependencies.—Assets likely to accrue, but which cannot be exactly determined.

Deposit.—A sum of money placed at interest with a banker for a specified time. The person doing so is termed a *Depositor*, and the account recording the transaction a *Deposit Account.*

Derelict.—A ship abandoned at sea.

Detinue.—An action for the recovery of withheld property.

Deviation.—In the marine commerce, departure from any of the terms of the policy of insurance. If it be a departure from the course laid down for the ship, without actual necessity such as stress of weather, it thereby vitiates the insurance.

Director —One of a body of proprietors deputed by the rest with power to control and direct its operations.

Discount.—A percentage allowance on payments of money before their due dates. As applied to shares or stock, it indicates the depreciation below the nominal value of such shares or stocks.

Dishonour of a Bill.—The refusal to accept a bill by the person on whom it is drawn, or the failing of an acceptor to pay it when it becomes due.

Dissolution of Partnership.—The act of breaking up an association formed for the purpose of trade, or the act of retiring from such association of one or more of the parties concerned.

Distringas.—A writ commanding a person to be confined for debt, or for his appearance on an appointed day.

Dividend.—The periodical division of the profits of a company. The distribution among creditors of the property of a bankrupt is termed a *dividend*, as is also the annual payment of interest on the National Debt.

Dock.—An artificial basin for the reception of ships, and to assist them in loading and unloading.

Docket.—A ticket or direction tied to goods; also a summary of any document or legal instrument.

Dock Warrants certify as to goods in charge of the Dock Companies, and specify the ship by which they were imported, the importer, date of entry, to whom deliverable, the distinguishing marks, packages, and the gross and net weight, with the date at which warehouse rent commences.

Dock Weight Notes contain specifications similar to those in the warrants. They are deliverable to purchasers of produce on payment of any deposit, and entitle them to the warrants on the completion of their payments.

Douceur.—A gratuity given for the exercise of any influence on behalf of the donor.

Draft.—A term applied both to bills and cheques; also an allowance made in weighing certain articles of merchandise.

Drawback.—The amount of duty refunded upon the exportation of excisable articles, or upon the re-exportation of foreign goods on which duty has been paid.

Drawer.—The person drawing a bill upon another, who is called the *Drawee.*

Dunnage.—Any articles used in stowing a ship's cargo, for the purpose of protecting it from damage. *Dunnage* is also required for trimming a ship laden with heavy goods (such as iron, etc.), by slightly raising the cargo.

Dutch Auction.—The plan of offering articles at nominal prices somewhat above their value, and gradually lowering them until accepted, the person who first assents becoming the purchaser.

Duties.—Taxes or imposts of any kind upon merchandise or manufacture, payable either through Customs or Excise.

Effects.—Personal or movable goods.

Elegit.—A writ commanding the goods of a debtor to be taken in execution, but not to be sold. The creditor remains in possession until satisfied, during which time he is *tenant by elegit.*

Embargo.—An order arresting the sailing of a ship or the removal of property.

Embezzlement.—The fraudulent appropriation by clerks or others of cash or goods placed by the employer in their care, or received by them on his account.

Emporium.—A principal place or mart for the purchase and sale of certain merchandise.

Endowment.—A fixed sum, payable at the end of a certain number of years, in the event of a person surviving the given time.

Engross.—To buy up in large quantities, so as to raise the price of the goods bought, and to sell at a profit. Also, *in law*, to copy in a large fair hand. He who does so is called an *Engrosser*, and the act is termed *Engrossing*, or an *Engrossment.*

Entrepôt.—An intermediate port for trade, or warehouse for the temporary reception of merchandise *in transitu.*

Erratum.—An error or mistake. Plural, *Errata.*

Et Cætera (&c. or etc.)—And so on.

Eviction.—The loss caused to the buyer of anything in consequence of its being proved to belong to a third party.

Evidence.—The proof of anything.

Exchange.—A term denoting the transactions by which persons in one country liquidate their debts with those resident in another, by the purchase and remittance of orders to pay debts owing in contrary directions ; these payments being collected by the person to whom such order is sent. These orders are termed *Bills of Exchange*, and the price at which they are to be purchased is determined by the supply and demand, or *Course of Exchange*.

Exchequer Bills are promissory notes issued by authority of Parliament, and represent the greater portion of the floating or unfunded debt of this country.

Excise.—A tax or duty upon certain articles produced or manufactured in the country. *Officers of Excise* or *Gaugers* are the persons appointed to collect these duties.

Executor.—One who is appointed by a testator to see that his will is properly carried into effect after his decease.

Ex Officio.—A term denoting the power a person possesses by virtue of his office.

Ex Parte.—Two Latin words signifying *in part;* as an act, deed, or statement by one party only, without the participation of the other.

Exports.—Goods sent out of a country.

Fac-simile.—An exact copy of an original, with all its peculiarities.

Factor.—An old term for *agent*, still retained in certain trades, as corn-factor, fish-factor, etc.

Factory.—An establishment in which some branch of industry is carried on ; also a place used by traders and agents (factors) for the negotiation of business.

Failure.—The suspension of payments by traders.

Fee.—A compensation or reward for services rendered.

Fiat in Bankruptcy.—The issue of judicial authority by the Court for proceeding in any case.

Fieri Facias (or *Fi. Fa.*).—A judicial writ, after judgment is obtained for debt or damage, commanding the sum to be levied on the effects of the defendant.

Finance.—The revenue of a king or state.

Financier.—One who manages finance.

Firm.—A term applied to any trading establishment carried on by more than one person, or styled with more than one person's name.

Fiscal.—Relating to the revenue or pecuniary affairs of a state.

Flotsam.—In marine insurance, goods floating on the surface of the waves—the term *Jetsam* being used when they are sunk under the surface of the water. Both appellations are distinctive from wrecked goods, which, to be considered such, must come to land.

Folio.—A leaf ; two pages numbered alike and facing each other, one being allotted to the Dr. and the other to the Cr. side of an account.

Free Port.—A port where no import or export duties are levied.

Free Trade.—The freedom of buying and selling goods without such restrictions as duties, etc.

Freight.—The sum paid for the transportation of merchandise forming the cargo of a ship, or for the hire of the whole or part of a ship.

Funds.—The interminable annuities or funded portions of the National Debt, sometimes called *Stocks.*

Garble.—The dross or refuse picked from spices, drugs, and other produce, in the process of *garbling* or sorting.

Garnishment.—The notice in cases of attachment given to third parties, called *garnishees*, not to part with money or goods in their possession, pending the settlement of claims against the owners. (See *Attachment.*)

Gauger.—A Custom House officer appointed to examine the contents of hogsheads, barrels, etc.

Gazette.—The *London Gazette.* A publication issued under authority of the Government, containing all parliamentary, official, legal, and commercial notices.

Goodwill.—The advantage accruing to any concern from an established trade or connection.

Gross.—The mass or bulk of anything.

Guarantee.—The undertaking to perform or pay for another in case of his being unable to fulfil his engagements, or committing a fraud with regard to the matter *guaranteed for.* The person doing so is termed a *Guarantor.*

Hat Money.—See *Primage.*

Home Consumption.—An expression used for the ordinary trade demand for various commodities consumed in the country.

Honouring.—Duly meeting claims or obligations.

House.—A word almost synonymous in its meaning with *firm*, but occasionally applied as well to a concern carried on under the name of one person only.

Hypothecation.—Giving a lien upon, or pledging documents conveying a right to, property in the hands of third parties. (See *Collateral Security.*)

Imports.—Goods brought into the country.

Indenture.—A deed or agreement in writing, with special covenants.

Indemnity.—Making good any loss or injury sustained.

Index.—An alphabetical list of the contents of a volume or account book, and specifying the page on which each item is to be found.

Indorse.—To write on the back of a document. The person writing is the *Indorser;* the person to whom he transfers any right is the *Indorsee;* and what is written the *Indorsation* or *Indorsement.*

In Formâ Pauperis (*in the form* (or *condition*) *of a poor person*).—A mode of bringing a suit to avoid the payment of fees.

Insolvent.—A person whose resources are insufficient to meet the whole of his liabities.

Inspectorship, Deed of.—A deed by which a person unable to meet his engagements places his business in the hands of his creditors, who carry it on until satisfied in whole or in part, under the hands of trustees termed *Inspectors.*

Insurance is founded upon the principle of general combinations for the purpose of dividing and appropriating amongst the whole body any individual loss that may arise, each member contributing a small percentage of his property to secure the rest—the contribution being in proportion to the risk to be incurred.

Interest.—The produce of employed capital, or the consideration due for the loan of capital at the expiration of the term for which it has been used. When money is lent with the stipulation that interest shall be regularly paid, yearly or half-yearly, and not be added to the principal as it accrues, it is termed *simple* interest; and when the stipulation is made that interest as it becomes due shall be added to and become part of the principal, it is termed *compound* interest, as the successive additions bear interest upon interest. Interest is also a term applied to any inherent or other right in, or benefit to be derived from, property, business, or security.

Interest (Short).—In marine insurance, when the value of the goods shipped is short of the sum insured. A declaration of this sum being at once made upon the policy, the insured are entitled to a proportionate return of premium. (See *Open Policy.*)

In Transitu.—Two Latin words signifying *in course of transmission,* or *on the way.*

Investment.—In commerce, laying out money. Capital sunk or employed in any permanent way is said to be *invested.*

Invoice.—A mercantile term for the account specifying the contents of each package of goods shipped, their cost, and the charges upon them; now generally applied to all specifications of goods sold.

I. O. U. (*I owe you*).—A memorandum acknowledging a debt.

Jerquer.—A Customs officer, whose duty it is to search vessels on their arrival, for the purpose of ascertaining whether any unentered goods liable to duty are secreted, with a view to their clandestine introduction into the country.

Jetsam.—See *Flotsam.*

Jettison.—The act of throwing overboard part of a ship's cargo, or cutting away masts, sails, etc., for the preservation of the rest of the cargo and ship. The owners of a ship or goods so jettisoned have recourse, by general average, upon the owners of the portion saved, who. in their turn, if they are insured, recover from the underwriters.

Joint Adventure.—A mercantile speculation in which more than one interest is concerned.

Lac.—A term used in India, denoting a sum of 100,000. One hundred lacs equal one *crore,* or 10,000,000.

Landing Account.—An account taken by the various dock companies and wharfingers of all goods landed, with their weights and other particulars requisite to the importers, accompanied by remarks as to the condition of the packages or merchandise.

Landing Waiter.—A Customs officer, whose duty it is to examine and take account of all goods liable to duty, on their being weighed after landing from the ship.

Lay Days.—The number of days allowed for unloading or loading ships, as stipulated between their owners and the charterers or freighters.

Lazaretto.—An establishment in which quarantine is performed, and in which the goods landed from ships in quarantine are fumigated previous to their introduction to the markets.

Lease or **Tack.**—A conveyance for a term of years (which term is always less than that which the lessor holds for) of houses, land, or any other description of property. The person granting the lease is termed a *Lessor,* and the person to whom it is granted a *Leaseholder* or *Lessee.*

Letter of Credit.—A letter from a banker or mercantile house, requesting their agent to pay money to a third party—the bearer of the letter.

Letter of Licence.—An agreement signed by the creditors of an insolvent or embarrassed trader, permitting him to carry on business for a certain time without satisfying their claims.

Letters of Marque.—Letters granted by a Government to its subjects, authorising them to fit out ships (called privateers) to prey upon the commerce of a rival country.

Levari Facias.—A writ of execution, commanding a sum of money to be levied upon the effects of a defendant.

Liabilities.—The debts and pecuniary responsibilities of any person or company.

Lien.—A conditional right of claim upon property, such as is voluntarily granted by its owners as a means of affording security in monetary transactions.

Lighterage.—The amount of freight or hire of a lighter or barge.

Limitations.—The period fixed by law for the recovery of debts. Those of an ordinary character become void in law after a lapse of six years, unless a written acknowledgment and promise to pay has been made during that period. For bonds, deeds, and judgment debts, twenty years are assigned

Limited Liability.—In Registered Joint-Stock Companies the limitation of the liabilities of each member for the debts of the company to the nominal amount of his shares.

Liquidation.—A course of settlement or winding-up.

Lloyd's.—Subscription rooms in the Royal Exchange, where the private underwriters or marine insurers attend for the transaction of their business.

Lloyd's Bonds.—An acknowledgment of indebtedness by a railway company originally given to a contractor for a portion of the line. They are in excess of the amount of debentures allowed by the Act of Parliament to the company granting them, and derive their name from the originator, who devised them as a plan for giving security to the builder of the line. Having the nature of a mortgage. and being for a portion of the original plant, they were supposed to be a first charge on the property of the company, but their legality has been called into question, and they cannot be readily negotiated in the money market.

Log Book.—A book containing a minute record of a ship's progress, and every incident occurring to her or on board of her during the voyage.

Mandate.—A delivery of goods to a person who is to do some act in connection with them entirely without reward. He who delivers the goods is styled the *Mandator*, and the receiver the *Mandatory*.

Mandamus.—A writ issuing from the Court of Queen's Bench, requiring the performance of certain specified acts. It is a writ of a most extensive remedial nature, and issues in all cases where the plaintiff has a right to have anything done, and has *no other legal means* of compelling its performance.

Manifest.—A statement made out by the master of a vessel previous to leaving port, specifying the whole of the cargo, ports of destination, etc.

Master.—The person entrusted with the care and navigation of a merchant ship.

Maximum.—The greatest quantity or part of anything. Plural, *Maxima.*

Measurement Goods.—Merchandise on which freight is paid by measurement instead of weight. A ton consists of 40 feet, and the solid contents in measurement of each package is ascertained by taking its length, breadth, and depth.

Merchant.—One who trades with foreign countries; an importer and exporter of goods and produce.

Minimum.—The least quantity or part of anything. Plural, *Minima.*

Monopoly.—A privileged or other absorption of an entire trade or branch of industry.

Mortgage.—A pledge of land or property by deed as security for money lent or owing. The person pledging is the *Mortgagor;* the one in whose favour the deed is executed the *Mortgagee.*

Muster.—An average sample or collection of samples.

Negotiable Document.—A document which in its transfer from one person to another conveys to the possessor a legal right to the money or property specified.

Net.—That which remains after the deduction of all charges, outlay, or allowances of any description.

Notary (Public).—A specially authorised person who attests, copies, or translates certain documents, proves their validity for the purpose of giving them effect abroad, and whose province is to *note*, and issue *protest* against, the non-acceptance or non-payment of bills.

Noting of a Bill.—A note taken of its presentation for acceptance or payment, customarily effected on a second presentation by a notary, as proof of the claim having been duly made.

Null and Void.—Of no effect.

Open Account.—An account in Dr. and Cr. form, exhibiting all open transactions between two parties, setting down the amounts of those transactions that are determined but not matured, and estimating the out-turn of those still pending, so that the balance shows a close estimate of the respective position of the parties concerned in the account.

Open Policy.—In marine insurance, where a certain sum is insured, leaving the declaration of the goods and their values to be subsequently made.

On dit *(People say)*.—Placed at the beginning of a sentence to denote that what follows is a flying rumour.

Options.—Speculative transactions on the Stock Exchange, where persons give so much per cent. for the *option* of buying or selling so much stock at a fixed price on a certain fixed day.

Overcharge.—An excessive charge or price.

Panic.—A sudden fright, especially when without cause. Used commercially to denote a general distrust with regard to money matters.

Par.—Exact corresponding value, neither enhanced by premium nor depreciated by discount.

Par of Exchange.—The comparative intrinsic value of the specie of different countries according to their fixed standards of weight and purity.

Partnership.—The combination of two or more individuals for the purposes of business in common, each deriving a share of the profits, or bearing a corresponding share of the losses arising from it.

Pass Book.—A book passing between bankers and their customers, which records all payments and receipts.

Passport.—A document granted by a consul, giving a description of the owner, and entitling him to pass through or to reside for a time in the country for which it is given. In maritime law, a document carried in time of war by a vessel to prove her nationality.

Patent, Letters-Patent.—A privilege granted under the Crown seal, conveying to the persons specified the sole right to make use of some new invention or discovery therein stated.

Penalty.—A sum to be forfeited for the non-completion of a contract or for a part of it.

Per Cent.—"*By the Hundred.*" Thus 5 per cent. would be five out of every hundred.

Permit.—A licence from the Excise authorities permitting the removal of goods upon which duty has been paid.

Pilot.—A person duly qualified and authorised to conduct ships through rivers, into or out of port, or through certain channels or roads.

Plant.—A trade term comprehending fixed machinery, implements, or other requisites for carrying on a business.

Policy of Insurance.—A document by which insurance companies and underwriters secure to the parties contracting with them for life, fire, or marine insurance, an indemnity against loss from the risk incurred. It is a document of considerable importance, stating the names of the insurers and of the insured, the amount and exact nature of the indemnity, and of the risk incurred.

Post, To (*Book-keeping*).—To transfer an entry from one book to another.

Postdate.—To date a letter or document of any description later than the day on which it is written.

Post Obit Bond.—A bond, the main condition of which is that it only becomes payable after the death of some person whose name is therein specified.

Précis-writing.—Writing the contents of a document in as short and condensed a style as possible.

Premium.—An additional sum beyond a standard or fixed price.

Premium (Insurance).—The percentage or sum paid by the insured for the indemnification granted by the insurer.

Presentment of a Bill.—The act of demanding, or presenting for, acceptance or payment.

Price Current.—A list or enumeration of various articles of commerce, with the market price of each.

Primage, or Hat Money.—A customary percentage paid by shippers, in addition to the freight of goods, and considered to be for the master of the vessel, for his care and trouble in taking charge of such goods while on board.

APPLIED MECHANICS.—XVIII.

[*Continued from p.* 217.]

PRACTICAL APPLICATIONS OF CENTRIFUGAL FORCE.

Perhaps the commonest application of the properties of a revolving body, to which we have just referred, is to be met with in the use of centrifugal governors on certain machines, especially on steam and other engines. The centrifugal governor in its simplest form was first employed on steam-engines by James Watt. It consists of a pair of heavy balls suspended by links, as shown in Fig. 107, the whole being caused to rotate by the engine to be "governed." If the speed increases, the balls fly out, raising the sleeve S, which is connected to the throttle-valve, through the bell-crank B; thus the steam supply is diminished or cut off altogether. The defect of such a governor is that the engine must first *change* its speed before the governor acts; but the change may be kept within very small limits.

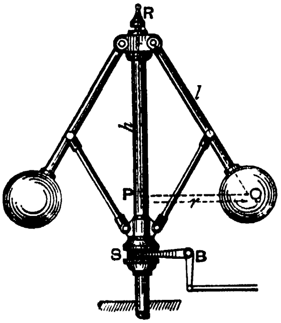

Fig. 107.

It will be an interesting exercise for the student to consider the equilibrium (neglecting friction) of the forces acting. Thus the pull of the link l is balanced by two forces, the centrifugal force F and the weight w of one ball, as shown in Fig. 108. The forces are parallel to the sides of the triangle, P Q R (Fig. 107); hence—

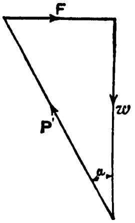

Fig. 108.

$$F : w = r : h \text{ or } F = \frac{wr}{h}.$$

More usually the governor is loaded, as in Porter's governor, shown in Fig. 40, in which case it is not difficult to prove that the force available to do the work of moving heavy parts and overcoming friction is increased by the device of loading the governor, in the ratio of $\frac{\frac{W+w}{2}}{w}$*, and that the speed of the governor is also increased as $\sqrt{(\frac{W}{2} + w)}$ to $\sqrt{w}$; on the supposition that the vertical movement of the two weights is the same. The constant load may be replaced by the variable load of a spring; but the effect is somewhat similar, the loaded governor being more "powerful" and running at a higher speed for the same opening of the balls. We have not space to refer further to this interesting subject; but the student can consult articles on the subject in the engineering journals.

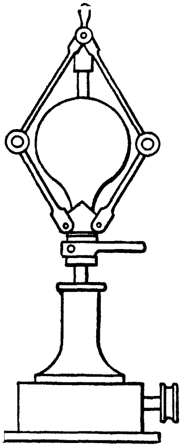

Fig. 109.

EXAMPLES.

1. Find the centrifugal force of a spherical ball of cast-iron 3 inches in diameter, when its centre is rotating in a circle of 2 feet radius at 150 revolutions per minute. A cubic inch of cast-iron weighs ·26 lb.

Answer, 56·3 lb.

2. Find the total centrifugal force of the two balls of a Watt centrifugal governor, the balls being of cast-iron 3 inches in diameter, when rotating with their centres 8·5 inches from the axis, at a speed of 90 revolutions per minute. If a constant weight of 20 lb. is placed on the sleeve of the governor, find the centrifugal force and speed necessary to keep the balls rotating at the same radius, friction being neglected.

Answers.

Unloaded governor, centrifugal force = 14·38 lb.
Loaded „ „ „ = 53·49 lb.
Speed of loaded governor = 173·7 revolutions per minute.

3. A locomotive passes round a curve in a railway of 500 feet radius, at a speed of 30 miles an hour. If the weight on one pair of wheels is 16 tons, find the outward or centrifugal force of these wheels on the rails, supposing them free to move outwards. If the centres of the rails are five feet apart, how much would the outer rail have to be elevated so that the resultant force due to gravity and centrifugal force would act perpendicularly to the plane of the rails? In such a question as this, is it necessary to know the weight of the train?

Answers. (1) Centrifugal force = 4309·6 lb
(2) Outer rail must be elevated = ·6 ft.
(3) No.

4. Show that Rankine's rule, by which the elevation of outer rail should $= \frac{\text{gauge} \times v^2}{15r}$, where v is the speed in miles per hour, is approximately correct.

HARMONIC MOTION.

When a body has such a motion that after a certain interval of time it is again passing any fixed point and *moving in the same direction* as before, its motion is *periodic*, and the time which it has taken is called the *periodic time* of the motion. A very simple example of periodic motion is that of a body moving uniformly on a circular path, the time taken in going once round the circle being the periodic time. There are many examples of periodic motion, and some belong to that peculiar class of periodic motions called ***simple harmonic motion.***

DEFINITION.—*Simple harmonic motion is the projection of uniform circular motion on a diameter of the circle.* The meaning of this definition will be understood from Fig. 111. Let a body move on the circumference of the circle with a *uniform* velocity, taking say $\frac{1}{10}$ of a second to go from A to B′, from B′ to C′, etc., these distances being equal. Now, if a second body moved in such a way as to always just occupy the position of a projection of the first on the diameter A L, this second body would have a simple harmonic motion. Its motion would *not* be uniform, but would be quicker towards the middle of its path and slower towards the ends; in

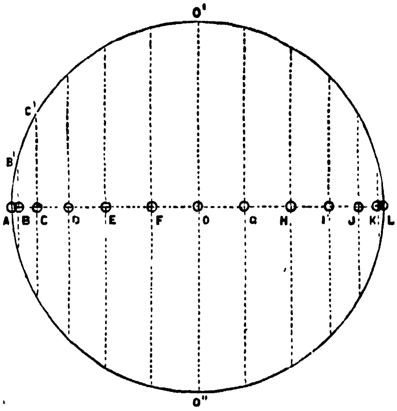

Fig. 110.

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* Professor Ewing in the article on the Steam Engine, "Encyclopædia Britannica."

fact, in the case we have supposed, it would take $\frac{1}{10}$ of a second to go from A to B, and the same time to go from F to O, which is a much greater distance. A heavy ball, suspended by a very long thin wire, has a motion very nearly of this kind when vibrating like a pendulum, and many motions with which the engineer is concerned approximate closely to simple harmonic motions.

There are certain peculiarities about this motion which might almost be taken as definitions of it. For instance, a body moving with a simple harmonic motion always has an acceleration proportional to its distance from its mean position, the positive acceleration being always *towards* that point. In other words, the body moves with an *increasing* velocity when moving *towards* the point referred to, and with a diminishing velocity when moving *away* from that point, the acceleration being proportional to distance from it. Since acceleration $= \frac{\text{force}}{\text{mass}}$, and the mass is constant, the *force* acting on the body urging it to return to its mean position must be proportional to its distance from that position. Either of these characteristics of simple harmonic motion may be taken as a definition of it, but we prefer that which has already been given.

The periodic time T of a simple harmonic motion is given by the following rule:—

$$T = 2\pi\sqrt{\frac{\text{displacement}}{\text{acceleration.}}}$$

No elementary proof of this rule is altogether satisfactory, but the following is as good as any:—

The acceleration of the point on the diameter is equal to the resolved part—along that diameter—of the centripetal acceleration of the point on the circumference—*i.e.*, the resolved part of $\frac{v^2}{r}$; which is $\frac{v^2}{r} \times \frac{x}{r}$.

$$\text{Displacement} = x,$$

$$\text{acceleration} = \frac{v^2x}{r^4} \therefore \frac{\text{displacement}}{\text{acceleration}} = x + \frac{v^2x}{r^2} = \frac{r^2}{v^2},$$

which is evidently constant. Now the periodic time T is the time taken to describe one circumference, hence (since distance = velocity × time),

$$2\pi r = vT, \quad \text{or } \frac{r}{v} = \frac{T}{2\pi},$$

$$\therefore \frac{r^2}{v^2} = \frac{T^2}{4\pi^2},$$

$$\text{hence } \frac{\text{displacement}}{\text{acceleration}} = \frac{T^2}{4\pi^2},$$

$$\text{or } T = 2\pi\sqrt{\frac{\text{displacement}}{\text{acceleration.}}}$$

To the student who possesses a slight knowledge of the Differential Calculus, the following brief demonstration may be useful:—

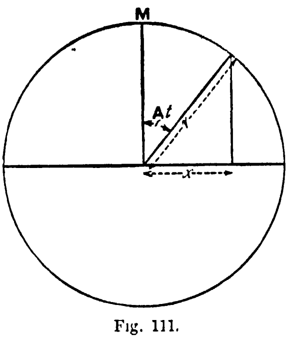

Fig. 111.

Let the body moving on the circle have an angular velocity of A radians per second, and let time be measured from the instant of passing O′ (Fig. 111). The displacement x of the projection agrees with the angular displacement At of a radius r. Referring to the motion of the projection, its velocity is—

$$\frac{dr}{dt} = Ar\cos At, \text{ since } x = r\sin At;$$

$$\therefore \text{acceleration} = \frac{d^2x}{dt^2} = -A^2r\sin At$$

$$= -A^2x,$$

which shows that acceleration $\propto x$.

If T is the periodic time—

$$AT = 2\pi,$$

or—

$$A = \frac{2\pi}{T},$$

and the rule just obtained becomes—

$$\text{acceleration} = -\left(\frac{2\pi}{T}\right)^2 x$$

$$= -\frac{4\pi^2}{T^2} \cdot x,$$

the − sign showing that the velocity decreases as the body moves *away from* its mean position.

The above rule may be put in the form—

$$T = 2\pi\sqrt{\frac{\text{displacement, } x,}{\text{acceleration,}}}$$

the negative sign being neglected. This is the rule already given for the periodic time.

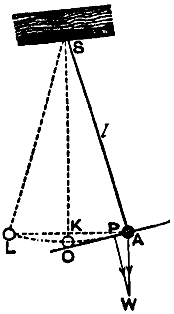

Fig. 112.

The application of these rules to different examples of simple harmonic motion will not present much difficulty. A few illustrations of the method of applying them will now be given.

EXAMPLE.—Find the time of vibration of a simple pendulum in terms of its length, and the value of g.

We can only represent a simple pendulum approximately, and this we do by suspending a small ball of heavy material by a long light silk thread which is supposed to remain of constant length. When the ball vibrates in small arcs, apply the rules already given. By referring to Fig. 113, it will be seen that the force acting along the tangent O A to the arc at A is—

$$W \times \cos OAW$$
$$= W \times \frac{AP}{AW} = W \times \frac{AK}{AS},$$

since the triangles KSA and PWA are similar. Now, since the arc is very small, AK may be taken as equal to the arc OA, which is the displacement x—

$$\therefore \text{force} = W\frac{x}{l},$$
$$\text{acceleration} = \frac{\text{force}}{\text{mass}} = \frac{Wx}{\frac{W}{g} \times l} = \frac{gx}{l},$$

and—

$$T = 2\pi\sqrt{\frac{\text{displacement}}{\text{acceleration}}}$$
$$= 2\pi\sqrt{x \div \frac{gx}{l}}$$
$$= 2\pi\sqrt{\frac{l}{g}},$$

l being measured in feet.

Note.—The time of vibration of an ordinary seconds pendulum is two seconds.

Another example is the vibration of a mass suspended from a cylindric spiral spring.

Example.—Suppose a spiral spring elongates x inches (x being usually a fraction) for 1 lb. increment of load, neglecting the weight of the spring itself, find its time of vibration with a load W lb. Consider the spring when x inches from its mean position. The force tending to bring it back is 1 lb., the displacement $\frac{x}{12}$ of a foot, and the acceleration = force 1 lb. ÷ mass of ball $= 1 \div \frac{W}{g} = \frac{g}{W}$, and hence the time of vibration is—

$$T = 2\pi\sqrt{\frac{x}{12} - \frac{g}{W}} = 2\pi\sqrt{\frac{Wx}{12g}}.$$

In a similar way the time of vertical vibration of the cage in a deep shaft of a mine may be worked out, the suspending rope acting in a way resembling the spiral spring in the last example.

NUMERICAL EXAMPLES.

1. Find the length of a simple pendulum which beats seconds at a place where the value of g is 32·29. Answer, 3·17 feet.

2. A ball weighing 20 lb. is suspended from a cylindric spiral spring. If the spring lengthen ·12 inch for an additional load of 1 lb., find the time of vibration, neglecting the weight of the spring. Answer, T = ·495 second.

3. A cage weighing one ton is supported by one mile of vertical steel wire rope, one square inch in cross-section. Taking Young's Modulus for the rope as 28000000, assuming that the rope and cage vibrate longitudinally with a simple harmonic motion, and that half the mass of the rope may be taken as existing only at its lower end, the other half neglected: find the time of vibration. Answer, 1·6 seconds.

LOGIC.—IV.

[*Continued from p.* 221.]

HYPOTHETICAL SYLLOGISMS—SORITES—INDUCTION.

HITHERTO we have treated only of the *pure* Categorical Syllogism, which consists of three categorical propositions, called by some logicians propositions *de inesse*, from their asserting that the predicate is (or is not) *contained in* the subject.

We have seen, however, that there are also Hypothetical Propositions, composed of several (*i.e.*, two or more) categoricals united to one another by a conjunction, called a *copula*, and named Conditional, Disjunctive, Causal, etc., according to the names given by grammarians to the respective conjunctions which unite them.

Now a hypothetical syllogism is one in which one, two, or all three of the propositions are hypotheticals *e.g.*, (1) "If this man is wise, he is happy; he is wise; therefore, he is happy." (2) "He who is wise, is happy; if he is a philosopher, he is wise; therefore, if he is a philosopher, he is happy." (3) "If he is wise, he is happy; if he is a philosopher, he is wise; therefore, if he is a philosopher, he is happy." Of these, such syllogisms as in the first example are far more common than those resembling the other two.

Hypothetical syllogisms are divided into *Conditionals* and *Disjunctives*, the other kinds of hypothetical propositions not giving rise to particular classes of syllogisms bearing their names.

A conditional proposition is said to have in it an *illative* force—*i.e.*, one of the two categorical propositions of which it is composed *results* or follows from the other. The name of *antecedent* is given to that from which the other results; and that which results from it is called the *consequent;* the connection subsisting between the two being termed the *consequence*. It should be remarked that it is entirely upon this consequence that the truth or falsehood of the conditional depends, and not at all upon the truth or falsehood of either the antecedent or consequent, or both of them. Either or both of these may be false or absurd, and yet the conditional be true, *i.e.*, the consequent may *follow from* the antecedent notwithstanding. For example, in this proposition, "If the atheists are right, there is no God," both the antecedent and consequent are false, and yet the conditional proposition composed of the two together is true, *i.e.*, the truth of the consequent follows from the truth of the antecedent.

The meaning of every conditional proposition, then, is—that the antecedent being granted, the consequent is granted also. This may obviously be considered from a twofold point of view:—1. If the antecedent *is* granted, the consequent must be granted. 2. If the antecedent *were* granted, the consequent would have to be granted. Hence are derived these two rules:—Firstly, the antecedent being granted, the consequent may be inferred (which does not require explanation). Secondly, the consequent being denied, the antecedent may be denied; because, if the antecedent could not be denied, *i.e.*, if it were true, the consequent (which is granted to be false) would be true also. These rules may be made clearer by an example. "If a state is well governed, the rights of the weaker are secured." Here, if we grant the truth of the antecedent, the truth of the consequent may, by the first rule, be inferred, and we may reason thus: "But this state is well governed, therefore the rights of the weaker are secured." These three propositions taken together give us a Conditional Syllogism. Every conditional syllogism of this kind, in which, by the application of the first rule, we, as it were, *build up* an argument, is called *constructive*, and is reducible to the form—"If A is B, C is D; but A is B, therefore C is D."

If, however, we apply to the same example the second of the above rules, we get what is called a *Destructive* Conditional Syllogism. Thus, "If a state is well governed, the rights of the weaker are secured; but the rights of the weaker are not secured in this state; therefore it is not well governed." "If A is B, C is D; but C is not D; therefore A is not B."

It must be carefully borne in mind that we cannot in either case reverse the process. We cannot infer anything at all if we deny the antecedent or affirm (*i.e.*, grant the truth of) the consequent. It is readily conceivable (to recur to the above example) that a state might be very badly governed in other respects where the rights of the weaker were secure, and consequently it does not necessarily follow from the fact that the rights of the weaker in a state are secure that it is well governed. So also for the same reason we cannot assert, because a state is not well governed, that therefore the rights of the weaker are not secure.

There are, then, only two kinds of conditional syllogisms—the one constructive, depending for its validity on the first rule; and the other destructive, depending for its validity on the second.

A Disjunctive Proposition is, as has already been explained, composed of two or more categoricals joined together by the disjunctive conjunctions, *either, or*. It states an alternative, *i.e.*, some one or other of its members must be true: *e.g.*, "This science is either pure, inductive, or mixed." Unless some one of these categoricals is true, the disjunctive must be false. In addition to this, however, there must also be some opposition between the parts, *i.e.*, they must be incapable of being all true at the same time. Thus: "Either this man is mortal, or he has red hair," though exactly corresponding in form with the proposition given above, is quite useless for any purpose of reasoning.

If one of the propositions of a syllogism be disjunctive, the syllogism is called disjunctive on that account. Suppose we have as the major premise, "Either A is B, or C is D," we may deny one of the categoricals in the minor, and then affirm the truth of the other in the conclusion:—"But A is not B; therefore C is D"; or, "but C is not D, therefore A is B." And in the same way, if, instead of being two, there were several categoricals, any one or more of them being granted to be false, some one or other of the remaining ones (if more than one), or the remaining one (if only one), may be inferred true: *e.g.*, "It is either spring, or summer, or autumn, or winter; but it is neither spring nor summer; therefore, it is either autumn or winter."

In most instances, however, not only (as we have already seen must be the case) is one of the categoricals true, but *only* one is true. The consequence of this is, that we are also able, if the truth of one or more of the members be granted, to deny the truth of the remainder: *e.g.* (referring to the above example), "But it is spring; therefore, it is neither summer, nor autumn, nor winter."

We must next speak of the *Dilemma*, concerning the nature of which different logicians have expressed very different views. Popularly, the dilemma is considered as an alternative argument, such that, if the conclusion of one train of reasoning be not admitted, that of the other must be; so that one has to choose, as is said, between the two "horns" of the dilemma. This is in the outline true, though not logically accurate; besides which the "horns" may be and often are more than two in number in the arguments to which the name is properly applied. In reality the dilemma is a complex argument, and partakes both of the nature of the conditional and disjunctive syllogisms. It may be described as a syllogism with the major composed of two or more conditional propositions (having each the same or different antecedents, and the same or different consequents), and with a disjunctive minor. It will thus assume one of three forms:—

1. SIMPLE CONSTRUCTIVE.

If A is B, C is D; and if E is F, C is D;
But either A is B, or E is F;
Therefore, C is D.

Here we have several antecedents in the major, each with the same consequent; and in the minor these antecedents being granted *disjunctively*—*i.e.*, it being granted that one or other of them is true—we infer categorically in the conclusion the truth of the one common consequent. The following is an example of this kind of dilemma :—

If this man is guilty, he should be placed in confinement; and if he is insane, he should be placed in confinement;
But he is either guilty or insane;
Therefore, he should be placed in confinement.

II. COMPLEX CONSTRUCTIVE.

If A is B, C is D; and if E is F, G is H;
But either A is B, or E is F;
Therefore, either C is D, or G is H.

If the criminal knew the consequences of his act, he was wicked; and if he did not know the consequences, he was insane.
But he either knew the consequences, or he did not know them;
Therefore, he was either wicked or insane.

Here we are given several antecedents in the major, as before; but each has a different consequent; and consequently when, as before, we are granted in the minor the truth of one or other of the antecedents, we can only *disjunctively* infer in the conclusion the truth of the several consequents.

III. DESTRUCTIVE (always complex).

If A is B, C is D; and if E is F, G is H;
But either C is not D, or G is not H;
Therefore, either A is not B, or E is not F.

If this man were wise, he would not speak irreverently of the Bible in jest; and if he were good, he would not do it in earnest;
But he does it either in jest or earnest;
Therefore, he is either not wise or not good.

In this case we have several antecedents in the major premise, each with a different consequent. These consequents are *disjunctively* denied in the minor, *i.e.*, it is asserted that some one or other of them is false, and then in the conclusion it is inferred from this that some one or other of the antecedents is false.

Before passing from the consideration of hypotheticals, it must be observed (in conformity with the statement that the syllogism is the type of all reasoning), that hypotheticals can by one means or another be reduced to categorical syllogisms, to which the dictum and other rules before given can be applied. All conditional propositions may, for instance, be considered as universal affirmatives, of which the terms are entire propositions, the antecedent being the subject, and the consequent the predicate. Thus, "If A is B, C is D," is equivalent to such a categorical as this: "The case of A being B is a case of C being D," and then (if we are dealing with a simple constructive conditional syllogism) the minor and conclusion may be represented thus: "This present case is a case of A being B; therefore it is a case of C being D." Sometimes, too, when the antecedent and consequent of a conditional have each the same subject, the syllogism may be reduced by simply substituting a categorical major premise for the conditional one—*e.g.*, "If Cæsar was a tyrant, he deserved death," might be represented by the proposition "All tyrants deserve death," the minor premise and conclusion remaining the same as before. Some of the methods by which hypotheticals are reduced to categoricals may appear somewhat awkward; but this is not of much consequence, as it is only to show the universality of syllogistic reasoning that such reduction ever is employed.

An *Enthymeme* is a syllogism with one of its premises suppressed. Which of the two remains to be supplied may be easily ascertained by observing whether the subject of the suppressed premise occurs in the conclusion or not. If it does, the major obviously is wanting; and if not, the minor: *e.g.*, "Cæsar was a tyrant; therefore, Cæsar deserved death," is evidently a syllogism in *Barbara* with the major, "All tyrants deserve death," suppressed. Of course we cannot determine upon the validity of the enthymeme as an argument until we have both the premises before us, and see whether they conform accurately to the syllogistic laws.

The *Sorites* is an argument composed of a series of propositions, in which the predicate of each is the subject of the next, until finally the conclusion is arrived at, which is formed of the first subject and last predicate in the series: *e.g.*, "Caius is a man; all men are finite beings; all finite beings are sentient; all sentient beings seek happiness; therefore Caius seeks happiness." (1) "A is B; (2) B is C; (3) C is D; (4) D is E; (5) E is F; therefore A is F."

An argument of this kind may be expanded into a series of syllogisms in the first figure, the conclusion of each (with the next in order of the propositions of the sorites, as major) being the minor premise of the next. There will thus be as many syllogisms as there are propositions in the sorites intervening between the first premise and the conclusion; the first being the only *minor* premise expressed in the sorites. Since, as we have seen, the minor only in the first figure can be particular, it follows that the only proposition in the sorites which may be particular is the first, all the rest being necessarily universal, as being major premises in syllogisms in the first figure. For a similar reason no proposition except the last can be negative; if otherwise, the syllogism in which that proposition occurred would have a negative minor, which is impossible in the first figure. The following diagram will make the process of the expansion of a sorites into syllogisms much clearer (the numbers referring to the propositions in the form already given). The above sorites will be reduced into four syllogisms, thus :—

1	2	3	4
(2) B is C,	(3) C is D,	(4) D is E,	(5) E is F,
(1) A is B,	[A is C],	[A is D],	[A is E],
[.·. A is C],	[.·. A is D],	[.·. A is E],	[.·. A is F].

There are also, of course, conditional sorites, in which the propositions are conditional, instead of categorical; but of these it is unnecessary to treat particularly.

Induction is, by some writers, regarded as a totally distinct process of reasoning from the syllogistic, or, at least, as ultimately depending for its validity upon quite other grounds than the syllogism.

According to Whately, the word "induction" is vaguely used; being sometimes employed to denote the process of *investigation* and collecting facts, and sometimes that of deducing an *inference* from the facts when ascertained: induction, in the former sense, being distinct, indeed, from the syllogism, but not being a form of *argument* at all; and in the latter sense, being, like all other reasoning, capable of being expressed in the syllogistic form. Moreover, he regards induction, and rightly, so far as it is taken to mean a process of *inquiry*, as quite outside the province of Logic altogether, the office of which is not to *get* premises, but to see what *conclusion* (if any) can be drawn from them when got, no matter how. So far as induction is a process of inference or reasoning, we may accept Mill's definition:—"The process by which we conclude that what is true of certain individuals of a class is true of the whole class, or that what is true at certain times will be true in similar circumstances at all times." Or we might describe it generally as the process by which we infer a proposition to be true universally from finding it to be true in a number of particular instances. Thus, to take Whately's example:—"The Earth moves round the Sun in an elliptical orbit; so does Mercury; so does Venus; so does Mars, etc.; therefore, all planets (the universal term which comprehends these individuals) move round the Sun in such an orbit." Here we have an example of inductive reasoning. But this argument, if it be reducible to the syllogistic form, is plainly an enthymeme, being incomplete as it stands. Now it is very seldom that an instance is found of what is called "perfect" induction, *i.e.*, one in which there is a complete enumeration of all the individuals, respecting which we assert collectively what we had before asserted separately, *e.g.*, "John is in England; so is Thomas; so is Peter; so is Francis: all the sons of Edward are John, Thomas, Peter, and Francis; therefore, all the sons of Edward are in England." Besides, such an induction is practically useless for the purposes of inference, as we have gained no further knowledge when we have stated the truth of the universal, which is merely made up of the particulars already enumerated, and nothing more. However, in the induction commonly employed, what is meant is, not that there is a complete enumeration (in many cases that would be impossible) of the individuals of the class, but that those which are enumerated are to be taken as a sufficient sample or number of instances to warrant us in drawing the conclusion that what has been found true of them is true of the rest also. Bearing this in mind, every induction will appear to be an enthymeme with the *minor* premise (that which contains the statement about the individuals) expressed, and can be reduced to a syllogism by supplying a major premise, which will, in all cases, be found to be substantially the same. This major is, as given by Whately, "What belongs to the individual or individuals we have examined, belongs (certainly, or probably, as the case may be) to the whole class under which they come." The example by which he illustrates this is—from finding on examination of several sheep, that they each ruminate, we conclude that the same is the case with the *whole species* of sheep; and from finding on examination of the sheep, ox, deer, and other animals deficient in upper cutting-teeth, that they each ruminate, we conclude (with more or less certainty) that quadrupeds thus deficient are ruminants; the hearer readily supplying in sense the suppressed major premise—namely, that "what belongs to the individual sheep we have examined, is likely to belong to the whole species," etc.

The origin of this major premise, and the grounds of its validity, are questions for Psychology and Metaphysics rather than for Logic proper. It is now generally held that it may be ultimately resolved into the Law of Causation—rather awkwardly called by Mill "the Law of the Uniformity of Nature." The view of Mill, and of those who hold that all our knowledge is derived from experience, is that "all reasoning is primarily from particulars to particulars": we are led by the Law of Association of Ideas to expect that what has happened before will happen again in similar circumstances. Experience soon shows us that this is often not the case, and that the only similarity we can rely on in nature is that similar causes will have similar effects. We cannot rely on the repetition of a mere *co-existence*. Men believed for five thousand years that all swans were white—that is to say, that the attribute white co-existed in every swan with its other attributes—yet the black swans of West Australia proved they were wrong. But we never have found that things happen without causes, or that similar causes have not had similar effects, unless in the second case some fresh causes were present counteracting the effect of the first. Even in this case, all the causes produce their effect; the sum total of the causes in the supposed cases is not alike, and therefore the cases are not really similar. Wherever, then, we can establish that the circumstances conjoined in any given case are conjoined through causation, we may be sure that all cases similar to this—similar, that is, in the absence of counteracting causes as well as in the presence of causes like those here present—will exhibit the same result. But in the absence of any such guarantee, we cannot conclude with certainty from one case to the next, still less to the whole class.

Other philosophers, among them Kant, have held that this "Law of Causation," or "Law of the Uniformity of Nature," is not acquired by experience, but is innate—is part of the structure of our mind, and that were we not absolutely certain of it, we could not be sure of our knowledge of the universe. Kant, indeed, held that it was identical with the principle which he regarded as the basis of the hypothetical syllogism. To discuss this matter would take us further into the subject than is desirable in an elementary work.

Both sides would admit that the inductions of science might be reduced to the deductive form, with the Law of Causation as an ultimate major premise. But the Law of Causation is regarded by Mill as itself "an induction of the rudest kind"—an induction by simple enumeration to which no contradictory instance has ever been found, and which our daily experience confirms in countless ways. More recently, our certainty of it has been ascribed in part to *inherited* experience. Each generation (it is said) has experienced fresh proof of its truth, and belief in it has become organised in some way in the physical structure of our brains; and has been transmitted, like other physical characteristics, by inheritance.

Mill's "four methods of inductive inquiry" are based on the following canons, which a little reflection will show to be special forms of the Law of Causation. We here give them in an abridged form:—

1. Agreement. Whatever in the various cases examined is always found correlated with the result in question, is some part of the cause. [This canon is not final because of the existence of *plurality of causes:* effects may be to all appearances similar, and yet may be produced by different causes. Hence the inquiry has to be prosecuted further by the aid of the method of Difference.]

2. Difference. Whatever by its addition makes a difference to the result in question is some part of the cause of the change.

3. Concomitant Variations. An antecedent and a consequent varying together, directly or inversely, are connected through causation.

4. Residues. When it is known that part of a phenomenon is due to certain antecedents, the remainder is the effect of the remaining antecedents [observed or hitherto unobserved].

These are rather methods of proof than of scientific discovery properly speaking. Discovery usually proceeds by the "deductive method," that is to say, by forming an hypothesis or supposition as to the cause of a given phenomenon, then by seeing to what conclusions the hypothesis will lead, and then by comparing these conclusions with the facts. The chief principles by which the observer is guided in testing his hypothesis may, however, be stated in the form of the above canons.

Example only differs from induction in having a *singular* instead of a general conclusion, and in being founded on a single case instead of on a number: *e.g.*, "Cæsar was regardless of human life; therefore this individual conqueror will be"—the suppressed major being such as this: "What is true of one conqueror we may expect to be true of another." The form was first noticed by Aristotle. Mill would say that it is an explicit example of that "reasoning from particulars to particulars" in which he believes all reasoning ultimately to consist.

FALLACIES.

A fallacy is defined by Archbishop Whately as "any unsound mode of arguing, which appears to demand our conviction, and to be decisive of the question in hand, when in fairness it is not." The part of Logic which deals with the classification and detection of the different kinds of fallacies is naturally the most popular and interesting, as well because it seems less dry and barren than the consideration of abstract rules, as because it exhibits in a more palpable form the practical use of an art of Logic in teaching men to guard against some of the mistakes in reasoning into which they might otherwise fall.

Now it will upon reflection appear plain that an argument may be incorrect or unsound in either of two ways—viz., either in the manner in which the conclusion is made to result from the premises, or in the grounds upon which one or both of the premises are themselves laid down or assumed. We may either reason wrongly from right premises, or our premises may be false while our reasoning from them is correct. In either case our supposed argument will be fallacious, the fallacy lying, according to the language of logicians, in the former case in the *form*, and in the latter in the *matter;* or, more technically still, *in dictione,* *i.e.*, in the words, in the one case, or *extra dictionem*, *i.e.*, outside the words, in the other.

In accordance with what has been previously said of the province of Logic, it does not profess to teach us to guard against errors and mistakes in the *matter* of our reasoning. This can only be done by a perfect knowledge of the particular science or branch of knowledge to which the premises of our argument relate; but when the premises are laid down, then the observance of the rules of Logic, as a test, will ensure that no error shall creep in between them and the conclusion.

The great division of fallacies, then, is into those in the form and those in the matter; into those in which the conclusion *does not* follow from the premises, and those in which it *does*. It is not, however, always possible accurately to determine to which of these two classes a fallacious argument should be referred. Thus in enthymemes it is often a matter of choice whether the premise left to be supplied should be taken to be one which is not true, or one which does not prove the conclusion. To take an example given by Archbishop Whately: if a man argues from the fact that a particular country is distressed, that it is under a tyranny, his suppressed premise may be *either* "every distressed country is under a tyranny" (which is plainly false), or "every country under a tyranny is distressed" (which does not prove the conclusion, as the middle term will be undistributed in both premises). Now, if the former premise be the one meant to be supplied, the fallacy is to be referred to those in form; if the latter, to those in the matter. This illustration shows how hard it is to attempt any classification of fallacies, to which no exception can be taken. The outline of the classification which we shall adopt will be that of Archbishop Whately, and many of our examples will be taken from the same writer, whose chapter on Fallacies is probably the most valuable and interesting of his whole work.

We have seen that in every argument which professes to assume the syllogistic form, the conclusion either does or does not follow from the premises; and that, in the latter case, where the conclusion does not follow from the premises, the fault lies not in our imperfect knowledge of the subject-matter, but in the reasoning alone. Hence, as these fallacies are violations of the rules which Logic lays down as those to which all sound thinkers are bound to conform, we may call them *logical* fallacies.

The most plain and obvious *logical* fallacies are, of course, those which arise from the violation of some one of the syllogistic rules already given; and upon them it is unnecessary to dwell here at greater length. It may, however, be remarked, that several unsound arguments not uncommonly to be met with may be referred to this head. Thus, if a person argues that a certain proposition is false because it has been successfully demonstrated that the grounds or premises upon which it was supposed by his opponent to rest are false, such a person would be using an unsound argument, in which he would be guilty of an illicit process of the major term (which we have already explained) —*e.g.*, if the ground adduced to prove the existence of a God was that it is universally believed, and an instance where no such belief prevailed was cited, then, if an attempt was made to argue that this *disproved* the existence of a God (instead of merely overthrowing the *single* proof which had been advanced), the fallacy might be represented thus: "Whatever is universally believed is true; the existence of a God is not universally believed; therefore it is not true." So also the fallacy of inferring the truth of the premises from the truth of the conclusion may be stated as follows: "What is universally believed is true; the existence of a God is true; therefore it is universally believed." This is obviously an instance of undistributed middle.

The middle, however, is often ambiguous, not from being undistributed, but from being used in a different *sense* in each premise. This gives rise to a very large class of fallacies, to which no one name can be assigned that will comprehend all.

When the middle term is thus ambiguous in sense, as having *in itself*, from its own equivocal nature, two significations, we have what is called the *Fallacia equivocationis* of logicians: *e.g.*, "Light is contrary to darkness; feathers are light; therefore feathers are contrary to darkness"—in which example there are, strictly speaking, *four* terms. No one would be deceived in such a case as this one; but it must be remembered that the ambiguity will often be less patent and more likely to escape observation from the premises being placed at a considerable distance from each other in the course of a long argument.

In the fallacy which is mentioned by logicians under the title of *Fallaciaamphiboliæ*, the ambiguity arises from an *amphibolous* sentence, *i.e.*, one which is capable of two meanings, not from the double sense of any of the words, but from its admitting of a double construction. "Pyrrhus the Romans shall, I say, subdue" (where the nominative to "subdue" may be either "Pyrrhus" or "the Romans") is an instance of such a sentence; but the English language does not furnish so many of them as the Latin and others like it, and the fallacy is therefore not often to be met with in this shape.

Ordinary language, however, is very elliptical, and thus terms not seldom become practically ambiguous, being differently applied on different occasions, although there is no real difference in the sense of the terms themselves: *e.g.*, "faith," which has in itself but one meaning, is employed by the votary of each different religion to denote his own peculiar form of belief. This may lead us without caution into arguments somewhat resembling the fallacy just mentioned.

An ambiguity arising from the context also gives rise to the fallacies of *Division* and *Composition*. In the fallacy of composition the middle term is used in the major premise in a *distributive*, and in the minor in a *collective* sense: *e.g.*, "Two and three are odd and even; five is two and three; therefore five is odd and even," where it is plain that the middle term "two and three" is ambiguous, denoting, as it does, in the major premise the two numbers *taken separately*, and in the minor *taken together*. This fallacy is employed whenever, as is not unfrequently the case, a person, after establishing some truth *separately* concerning *each* member of a class, then infers the same to be true of the *whole collectively*. This is the same thing as contending that, because it is not improbable one may throw a six *in any one* out of a hundred throws, it is not improbable that one may throw a six in *each* of them, *i.e.*, a hundred times running; the absurdity of which is plain: but yet, hardly any fallacy is more common or more likely to deceive than this. The fallacy of division, on the other hand, occurs where the middle term is first taken collectively in the major premise, and then distributively in the minor—*e.g.*, "two and three are five; two and three are two numbers; therefore five is two numbers." Here the middle term is in the major premise, "two and three" *together*, and in the minor "two and three" taken *separately*. The ambiguity of the word "all," which means sometimes "every one separately," and sometimes "all together," not unfrequently gives rise to this fallacy of division.

There is also another kind of ambiguity occasioned by the context—viz., where the middle term is used in the major premise to signify something considered simply in itself and as to its essence; and in the minor for the same thing, with some of its accidents taken into account along with it. The example commonly given of this, the *Fallacia Accidentis*, as it is called, is this: "What is bought in the market is eaten; raw meat is bought in the market; therefore raw meat is eaten." Now in this case the context shows that the middle in the major merely denotes the substance or essence of the thing bought, but that in the minor it is used for the same thing, with the accident of "being dressed" superadded. If the accident is understood with the middle in the major premise instead of in the minor, logicians give the fallacy the somewhat lengthy Latin name of *Fallacia a dicto secundum quid ad dictum simpliciter*, *i.e.*, the fallacy of arguing from what is said with a certain accidental reference to the same thing said absolutely.

Under the head of ambiguous middle we may also class the *Fallacia Figuræ Dictionis*. "This," to quote from Archbishop Whately, "is built on the grammatical structure of language, from men's usually taking for granted that words belonging to each other, as the substantive, adjective, verb, etc., of the same root, have a precisely correspondent meaning, which is by no means universally the case. Such a fallacy could not indeed be even exhibited in strict logical form, which would preclude even the attempt at it, since it has two middle terms in sound as well as in sense: *e.g.*, '*Projectors* are unfit to be trusted; this man has formed a *project;* therefore he is unfit to be trusted'; here there is an assumption that he who forms a *project* must be a *projector;* whereas the bad sense that commonly attaches to the latter word is not at all implied in the former." There is a similar want of complete correspondence in the meaning of "presume" and "presuming," "art" and "artful," "design" and "designing," and many other words.

The last of the *logical* fallacies we shall notice separately is the *Fallacia Plurium Interrogationum*, or, "fallacy of several questions." This consists in asking two or more questions, really distinct, which *appear* to be but one, so as to entrap an opponent into giving but one answer, which, though only applicable to one of the questions, may be taken as an answer to the other or others. The way in which it must be defeated is by giving a separate answer to each question. A good instance is given by Archbishop Whately of its employment by a Parliamentary Committee in 1832, before which a witness was asked "how long the practice had *ceased* in Ireland of dividing the tithes into four portions"; two questions being thus combined:—1. Had this practice ever existed? 2. If so, how long had it been discontinued? Sometimes the ambiguity which gives rise to this fallacy lies not in the meaning but in the *distribution* of a term: *e.g.*, "Did this man act from such and such a motive?" which may mean, was it *one* of his motives? or, was it his *sole* motive? So also the question, "Has a state a right to enforce laws?" is ambiguous from the fact that "laws" may mean either "some laws," or "any laws, without exception," *i.e.*, may be understood as undistributed or not.

BRITISH COMMERCE.—VI.

[*Continued from p.* 226.]

TIMBER (*continued*).

From Brazil and Rio de Janeiro comes rosewood, so named from its odour while still fresh. It arrives in planks about 12 feet long, with a flat and a rounded side, each being apparently half of the tree trunk. The chief use of this wood is for library and drawing-room furnishings.

Walnut, in the days when mahogany and rosewood were still unknown, held the highest place in the manufacture of furniture. It comes from Italy, and, besides being used extensively for tables, bookcases, and the larger articles of furniture, is also made into gun-stocks. From America comes black walnut. It has no ornamental value.

The main bulk of building timber comes from the pines and firs of North Europe and America. To enumerate the different trees alone whose wood supplies raw material for the builder and carpenter and cabinet maker would occupy too much space, and the instances given, with the additional notes on other woods in Commercial Botany lessons, must suffice.

In the early part of the present century heavy duties were placed on Continental timber with a view to encourage the trade in American timber. Here is what a contemporary writer set himself to prove when the irksomeness of these duties was being felt:—That this country suffered serious loss through the high price and bad quality of North American timber as compared with the Baltic; and that the Colonies, so far from being benefited, were in fact greatly injured by this forced trade. Among the arguments against admitting the Baltic timber duty free was one to the effect that the Baltic merchant would take our money instead of our produce in exchange for the timber we purchased of him. This is an argument very much like some that may be heard even at the present day, and here is how the reviewer answers it:—"But how is it proved that the Baltic lumberer will not take our produce in return for his wood? By the fact that he has not bought our produce. But why has he not bought our produce? Because he had not the means. Do we pay for Swedish iron in money? Supposing the Baltic merchant to take money, what would happen? Would he eat his money? would he wear it? He would purchase with it the commodities he wanted, and these could be, and would be, most cheaply furnished by England. And can that money have been procured in England, except by the sale of some kind of British produce to somebody? Suppose the Baltic man would take only Turkey coffee; would anybody object to a transit trade in Turkey coffee? Why then in gold or silver? The truth is, that the market for our produce would be materially increased by the measure (the measure abolishing the duties). The North American Colonies would still have the purchasing power they now have, and the Baltic people would have acquired a power which they had not before."

An idea of the difference in quality between American and Baltic timber may be gathered from this statement, made before a Parliamentary Committee to inquire into the timber trade in 1820–21. Said the witness:—"About the year 1796, to the best of my recollection, there was a certain number of frigates built of the fir of the Baltic, and their average durability was about eight years. About the year 1812, there was a considerable number of frigates built also of fir, the growth of the North American Colonies, and their average durability was not half that time."

In lumber districts, such as those in British North America, it is usual to fell the timber in the winter time. The men work in gangs, and the chief or foreman allots to the rest their work and selects the place for working. In fixing on a spot accessibility from roads and rivers has to be considered, as the cost of transport might exceed the worth of the timber. As described by a visitor, the foreman then "informs the liner who leads the gang of timber makers. He with his assistant the feller make their way to the place, and, selecting their tree, ascertain how it lies, and which way it is best for it to fall"—determined by the lay of the land, the crooks of the tree, direction of the wind, and so on. "Having done this and cleared away the brushwood, which would interfere with the swing of their long-handled axes, they place themselves one on each side of the tree, and assail it furiously, making the chips fly on every side, and causing their blows to resound through the forest."

After felling the tree, the next point is to get as much timber out of it as possible. It is consequently topped as far from the butt-end as possible, and then it is lined—an operation of such importance that a good liner always commands the highest wages. "Planting one end of the line at the top of the stick, the feller makes his way to the butt, and there holds the line awaiting the directions of the liner, who, mounting the log, takes a general survey, and just laying his measure across the tree to see what sized stick it will make, strikes the first line by eye. He then lays off the line for the other side by measure, dotting off with his chalk the spots through which the line should run, at butt, centre, and top; and after one more last look the second line is struck and the business is completed."

After the liner come the scorers. These notch the log to within half an inch of the liner's marks

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COMMERCE.

RAISIN HARVEST.

OLIVE-GARDEN.

A TEA CLIPPER.

GATHERING AND PACKING ORANGES.

TEA PLANTATION.

and at regular intervals, and split off the blocks between. After the scorer comes the hewer, who levels the faces of the log. Such is the employment that men away in the heart of Canadian forests pursue in the winter. They are away from home, and live in rude shanties made of logs. Round three sides of one of these shanties are usually arranged the beds, the fourth side being devoted to culinary purposes. "One end of a narrow shelf, covered with tin plates and dishes or cups, serves for butler's pantry; the other end supporting two or three huge round loaves, fifteen inches in diameter and six inches thick, together with numerous pieces of cold boiled pork, was the larder; while the scullery was in the corner below, where were the great pots for boiling the pork and baking the bread. Seated on the bench between the beds and the caboose, with his legs tucked up under him, an immense loaf on one side and an equally large pot containing fried meat on the other, with a large slice of bread in his hand, and a piece of meat under his thumb, without even the decency of an intervening thumb-piece, was the presiding genius of the place, the cook, pleasantly occupied in picking his teeth with his pocket-knife."

After the trees have been felled and hewn, they are collected on the river banks, where they remain until the breaking up of the ice in spring, when they are floated down stream in rafts.

Immense tracts of territory are still under forest both in Europe and America. The forest acreage in Russia is 527,426,500; Sweden, 42,365,900; Germany 34,181,900; Austria, 23,280,400; France, 22,687,700; Hungary, 22,514,450; and Norway, 18,920,509; while in America it is estimated at 380,000,000. Yet, with such vast forests, there are those who are apprehensive as to the world's future timber supplies. The mere extent of territory covered by forest does not convey an accurate idea of the stores of existing commercial timber, as much of the produce of wild forests would be unsuited for working up. Even in America, where forests were considered a nuisance not so very long ago, the planting of trees is encouraged, and the day called Arbor Day is now quite a national institution.

FRUIT.

Our fruit imports are divided for fiscal purposes into two great classes—dutiable and duty-free fruits. Those fruits upon which a duty is levied are: currants, the duty being 2s. per cwt.; figs and fig-cake, plums and prunelloes, dried or preserved plums, prunes, and raisins, the duty on each of these being 7s. per cwt. All other fruits that enter our ports do so duty-free; such are apples, oranges and lemons, bananas, pine-apples, and so forth.

Of raw apples our total imports in 1890 were 2,574,957 bushels, of the declared value of £786,072. These came chiefly from:—British North America, 642,110 bushels, valued at £210,634; Belgium, 603,506 bushels, valued at £174,891; United States, 503,952 bushels, valued at £164,329; France, 396,375 bushels, valued at £91,726; and Holland, 139,579 bushels, valued at £44,144.

Oranges and lemons arrived here to the extent of 5,746,135 bushels, of the declared value of £1,756,852. The leading countries whence these supplies come are: Spain, 4,160,178 bushels, of the value of £1,277,769; Italy, 1,051,828 bushels, at £312,654; Egypt, 180,349 bushels, at £56,658; Azores, 133,993 bushels, at £30,739; Portugal, 94,579 bushels, at £32,652; and Turkey, 60,203 bushels, at £21,919.

Other raw fruits, duty-free and unenumerated, amounted to 3,584,668 bushels, of the declared value of £1,806,811. The bulk of this came from Spain, France, Germany, Holland, and Belgium. Of dried fruits, unenumerated, the imports were 466,237 cwt., of the declared value of £397,289, and this mostly from Turkey. Of fruits, preserved without sugar and unenumerated, the amount was 32,820,965 lb., of the declared value of £269,184, Italy contributing more than the half, and important quantities coming also from the United States, British East Indies, France, and Spain.

Among dutiable fruits, the first place in point of quantity and value is held by currants. These came to us to the extent of 1,139,939 cwt., of the declared value of £1,346,810, Greece practically contributing the whole, viz., 1,136,796 cwt., at £1,343,566. Figs and fig-cake, chiefly from Turkey, figured up to 129,856 cwt., of the declared value of £231,969; plums and prunelloes, from France, 18,982 cwt., of the declared value of £60,964; preserved plums, from Germany, Portugal, and Austria, 9,046 cwt., of the declared value of £16,089; prunes, from France, 21,435 cwt., of the declared value of £35,102; and raisins, from Spain and Turkey, 561,848 cwt., of the declared value of £1,006,898.

Notwithstanding the immense quantities of fruit represented by the foregoing figures, there are yet those who regard the import fruit trade as only in its infancy. Improved means of communication, improved methods of preserving perishable articles, and improved processes of cultivation in foreign countries are looked upon as likely to make us independent of the seasons.

The edible banana is cultivated chiefly in Central America, Mexico, United States of Columbia, Brazil, Peru, and the West Indies. The plant requires warmth and moisture, and is grown from slips usually planted as shade for other crops. Its leaves attain as great a length as six feet and a breadth of a foot and a half. The fruit intended for exportation is plucked before it is quite ripe and while still green, the rich golden colour in which we know it coming on on its being kept. The edible portion of the fruit is highly nutritious, and contains a large amount of sugar and starch. It is important as an article of food in the tropics, and grows in great abundance. Similar to the banana, though much coarser and larger, is the plantain. It does not come to this country, and is confined to native uses.

Citrons grow in the open in India, Burma, China, Persia, around the Mediterranean, in Florida, and the West Indies, and are the fruit of an evergreen. They are chiefly used for making candied peel, the centre of which trade is at Leghorn. The peel is also shipped here in brine in casks. The fruit grows to a great size. Only the thick skin is eaten as a preserve. From the rind, too, is obtained an essential oil used for purposes of perfumery. This oil is sometimes confused with citronella oil, which is cheap and largely used in perfuming soaps. It is from a kind of grass, and is imported in large iron drums.

The great currant-producing country is Greece, and the districts there mainly devoted to it are Zante, Cephalonia, Ithaca, and round about the currant port of Patras. This well-known fruit is the berry of a species of grape-vine, and it has been used in times of scarcity of the wine-grape by French wine-makers. The plants are laid out in vineyards in rows about 6 feet apart, and are either propagated from shoots or grafted upon grape-vine stocks, beginning to bear fruit in three or four years and declining in their yield in about eight years.

After ripening the currants, which grow in huge bunches a foot and a half long, are gathered and laid out on the ground to dry in the sun. While drying they are turned repeatedly, to prevent them from fermenting and to expose all parts of the layers. This turning operation also detaches the berries from the stems. They are then put into casks and packed down by trampling them with the feet. Formerly Corinth was the chief place for the cultivation of currants; hence the name, which is a corruption of Corinth.

The date-palm, though found in its most flourishing condition in countries that are noted for their absence of rain, will yet not bear fruit unless it be well watered. It may be grown both from seed and from shoots, the latter producing the best and most profitable trees. In half a dozen years from planting the trees begin to yield, and continue fruitful for from 150 to 175 years. The yield of a tree at its best time is about ten bunches, each bunch of about 20 lb. The best dates, known as Tafilat dates, come from North Africa, Algiers, and Tunis, and to be in prime condition are gathered just before ripening, being exposed to the sun for a few days to complete the ripening process. The dates that arrive here in a caked or crusted state are said to be damaged through having been allowed to ripen on the trees and drop to the ground. They are so cheap, however, and abundant that damaged dates are not likely to command the notice of any one; even those that are perfectly sound have scarce any care expended upon them. The palms are cultivated in groves, and along the Euphrates and Shat-el-Arab these groves extend for 150 miles on both banks, so as to be convenient for water. The trade in dates has led to a large industry in Norway, whence boxes to pack them in are exported in ship-loads. These boxes are not put together until they reach the plantations. The sides, tops, and bottoms of each box are tied together as so many boards.

Besides its nutritious fruit, the date-palm also provides a useful hard wood, its sap, fermented, provides a wine, its seeds an oil, and its leaves are converted into many articles of domestic utility. Not long ago it was pretended in this country that good coffee could be made from dates, and at so cheap a price that the coffee plant would no longer be profitably cultivated. Samples of this so-called date-coffee were pronounced to be indistinguishable from ordinary coffee. It ultimately transpired that it was coffee made from the coffee berry. Meanwhile, however, a too credulous public had subscribed large sums of money to develop the new industry. To the thirsty traveller in the desert the date-palm is a sign of water.

From the fig-tree two crops are annually gathered —one at the beginning of summer from the previous autumn's buds, and the other in autumn from the spring buds. The latter is the best. When ripe, the fruit is plucked and exposed to the sun and air to dry. If left to dry in their natural form and packed without force, they are known by the term "natural"; if, however, they be flattened during the drying and packed in layers with considerable force in small boxes, they become what are known as "pulled" figs. The best figs are those from Smyrna and branded "eleme," Turkish for hand-picked. The pulp of a good fig should be dark, and the skin thin, allowing the seeds to be seen through it. Figs are often roasted and ground into a powder to adulterate coffee with.

The lemon of commerce is cultivated chiefly in Corsica, Florida, Italy, Portugal, Sicily, and Spain. It is the fruit of *Citrus Limonum*, a native of the Himalayas, generally grown conjointly with the orange. Two crops are gathered annually—a light crop in early winter and the chief crop in September.

It is prized chiefly on account of its juice, which is much used in effervescing draughts, and provides us with a powerful anti-scorbutic.

Limes are a species of orange, and are most successfully cultivated in the West Indies. Moisture is essential to the life of the plant, which begins to yield about six years from the time of planting the seed, and continues to bear for upwards of a dozen years. The fruit is plucked frequently during the year. It is then taken from the plantations to the factories, where it is cut into slices by machinery and squeezed between rollers. The juice from fruit of a superior quality is put straightway into casks and headed down; that from an inferior quality is boiled down to within a tenth part of its original bulk, and ultimately converted into citric acid.

Of the common orange there are two leading kinds—the bitter or Seville orange and the sweet or Portugal orange. Both varieties are extensively cultivated throughout the Mediterranean, the Azores, West Africa, China and Japan, Australia, Fiji, West Indies, Central America, Brazil, Mexico, and California. Warmth and moisture are the climatic conditions most essential to the successful growth of the plant, which is propagated from transplanted young plants reared from wild seed—these plants being grafted with shoots from cultivated trees. At the final transplanting the distances maintained between the plants vary; in Italy they are 13 feet, in Trinidad 25 feet, and in the Azores 30 feet, the intervening spaces being occupied by subsidiary crops such as melons, or whatever will not obstruct the light and air from the orange plants, which with proper care will continue to yield fruit for seventy years.

From the rind of the orange an oil used in perfumery is distilled, and another from the flowers. Boiled in sugar, the peel is also candied.

Pine-apples are the fruit of *Ananassa sativa*, a plant that is found in a wild state in most tropical countries, but is cultivated mainly in the West Indies. It is reared mostly from suckers, and begins to bear about a year and a half after planting. The suckers are planted at intervals of about 2 feet apart, and require periodical hoeing. The fruit is plucked while still green and allowed to ripen on its way to the market. The best comes from the Azores, and large quantities, canned, are sent from the West Indies. The cultivation of this plant is now being pursued in the Australian colonies. The juice of the pine-apple, when eaten in the sun, burns off the skin of the lips and gums when eaten. In the Philippine Islands the pine-apple plant is cultivated for its leaves, which yield a valuable fibre which makes good paper and ropes, and is woven into a beautiful fabric, known as pina. and used in ladies' dresses.

Raisins are simply dried grapes, chiefly produced on the Mediterranean borders of Spain. From here two kinds are sent—muscatels, used as dessert, and those from Valencia, used in cooking. Those known as sultanas come from Turkey, and still larger specimens, Damascus raisins, from Damascus. One mode of preparing raisins is to cut the stalks of the grape bunches, when ripe, half through and leave them hanging to the vine to dry. This the sun and air soon accomplish, and leave the fruit with all its flavour and its natural bloom. Another way is to lay them out on sloping floors, exposed to the sun and covered with pebbles. The fruit is then put under cover and sprinkled with a solution of potash, which makes the sugar of the grape candy, and so produces the little sweet lumps so commonly met with in raisins. The usual treatment is simply to dip the bunches into a cauldron full of boiling lye, the lye being a solution of wood-ashes and water. The different qualities of raisins are due to the different physical conditions under which they are grown, and the different methods adopted in curing them.

Nearly half of our imports of raw apples are from British North America and the United States. These apples, now so famous, are the fruit of descendants of imported trees from the Old World. The first trees known to bear in the New World were on Governor's Island, near Boston, and are recorded to have yielded ten apples on October 10th, 1639. In the following year the first American nursery was established near Salem, Massachusetts, the trees being all imported. Now the traveller across America, within a belt 100 miles to the north and 100 miles to the south of the great lakes, never loses sight of orchards.

The apple crop is gathered in the autumn; those intended for export being hand-picked from the trees and carefully packed in barrels. An apple that has suffered the slightest bruise is rejected, as it would corrupt the whole barrel. Those that fall from the tree are used for making into cider or given to the pigs or cattle. Others that may have been damaged, or are not of sufficiently high character to attract the buyers, are pared, cored, and dried during the long evenings of the winter months. The refuse or pulp from the cider-presses supplies the apple-seeds required by the nurserymen.

METEOROLOGY.—IV.

[*Continued from p. 254.*]

THE PRESSURE OF THE ATMOSPHERE AND ITS EFFECTS UPON WIND AND WEATHER.

THE division of winds into constant or trade winds, prevalent winds such as the anti-trade winds, periodical winds or monsoons, and local winds, and their geographical distribution, have been already dealt with in our lessons in Physical Geography (Vol. I., p. 145–6); but mention may be made here of certain local winds which have received distinctive names. In Switzerland, the *Föhn* is a dry hot wind coming down the Alps from the south. On the Italian side of the mountains it is charged with moisture from the Mediterranean; but, meeting the mountains, it is cooled and parts with this moisture, and, descending some thousands of feet on the Swiss side, it is warmed and takes up moisture as it comes down. Similarly, the *Scirocco*, or south-east wind, is hot and dry as it descends from the interior of Africa to the coast and to Malta, though it then takes up moisture from the Mediterranean. In Spain it is known as the *Solano*, and is still charged with the dust of Africa. The *Harmattan*, a hot east wind from the interior, experienced on the west coast of Africa, is of similar origin. Conversely, the cold northerly winds from the Alps southwards are known as *Mistral* in Provence, *Tramontana* or *Settentrione* in Italy, and *Bora* in Dalmatia.

Though a great variety of circumstances may affect the local condition of the wind at the earth's surface both as to direction and as to force, so close is the connection between the more widespread fluctuations of atmospheric pressure and the main movements of the air that it is laid down as a fundamental principle of meteorology that "isobars represent the effect on our barometers of the movements of the air above us, so that by means of isobars we trace the circulation and eddies of the atmosphere."

As to direction, as we have seen, the wind is not parallel to the isobar, but inclined from 30° to 40° from it towards the nearest low-pressure area. This low-pressure area, according to Buys Ballot's law, will, in the northern hemisphere, be always to the left hand if you stand with your back to the wind, and to the right hand in the southern hemisphere.

As to velocity, the force of the wind is roughly proportional to the closeness of the isobars, this closeness being measured, not by the number of miles between them, but by the barometric gradient or slope measured at right angles to the isobaric lines.

Not only, however, does the direction and velocity of the wind depend upon the differences of pressure which the isobars represent, but the condition of the weather, using the term "weather" in the more restricted sense of the condition of the sky as to cloud, rain, etc., is also dependent upon them. Whilst, however, it is easy in many cases to refer back the direction and velocity of the wind to its real causes, of which the isobars are merely a symptom, in dealing with weather it is found better as a matter of practice to content ourselves with an apparently empirical association of certain forms of isobaric curves with certain conditions of weather, without attempting to revert to the complex causes of which they are the symptoms. Weather is not directly associated with the closeness of the isobars, but with the shape of their curves—*i.e.*, not so much with the varying amount of pressure as with the distribution of the pressures over neighbouring areas on all sides. We have thus an empirical method of weather-prognostication in which we content ourselves with considering the isobaric curves as laid down on the recent barograms. Of the seven chief forms of isobars, no special forecasts can be associated with "V-shaped depressions" or with "cols." A V-shaped depression, known for brevity's sake as a V, is a V-shaped bend of an isobar having lower pressure between the two arms of the V than along them or outside them. The term "col" is used in meteorology in a sense analogous to that in which we employ it in geography, a col on a weather-chart being a short and narrow area of low pressure between two anticyclones, just as in a mountain-chain we apply the term to a pass between two peaks, or low ridge at the heads of two diverging valleys.

With each of the other five chief forms a particular kind of weather is very constantly associated; so we may describe the form of the isobars and the resulting weather together.

A *cyclone* is a series of concentric isobars surrounding an area of low pressure. If these isobars are close together—if, that is, the gradients are steep—the cyclone may produce storms; but there is no difference between such steep cyclones and more wide-spreading ones save that of intensity. The curvature of the isobars in a cyclone is seldom exactly circular, being more often oval or elongated in the direction in which the whole system of circulation is travelling, which in the British Isles is generally towards the north-east. This elongation of outline gives us a *front* and a *rear*, a right and a left side to a cyclonic system. As the system advances on its course, the barometer falls at its front and rises more or less at its rear, so that there is a central line of lowest pressure crossing the path of the cyclone, or rather crossing the longer axis from front to rear, which is known as the *trough*. Speaking generally, the wind rotates round the centre of the cyclone against watch-hands. Thus, if the cyclone be travelling north-eastward, the wind in front will be south-easterly; further round, east-north-east, as far as the trough; then north-north-west to west in the rear; and south-west to south-east round to the front again. In front the wind blows rather across the isobars; but in the rear of the trough it is parallel with them. Its velocity along any part of its course will depend, as we have seen, only on the closeness of the isobars. Over the whole front portion of the cyclone-system the weather will be muggy and oppressive, the sky gloomy, and the clouds stratus, merging outwards into cirro-stratus and backwards into strato-cumulus and cirrus. The advance of the front of the system will be marked by a watery appearance of the sun, a pale moon, restlessness in animals, rheumatic and neuralgic pains in man, the aching of corns or old wounds, and the rise of bad odours from drains, followed by nimbus-cloud and rain, at first in a drizzle and showers, and then steadier and heavier. Then, after squalls and clearing showers in the trough of the cyclone, with patches of blue sky, cumulus cloud with windy cirrus on the margin of the system, the weather in the rear of the cyclone becomes cooler, drier, and fresher. Another popular prognostic connected with the front of the cyclone is the occurrence of halos round the sun or moon, a break in the halo indicating the quarter whence rain, or snow, and wind may be expected. This is explained by the fact of halos being generally seen in the south-west or west when the sun or moon is low and the lower part of the halo being lost in the gloom on the horizon, whilst it is from these west and south-west regions that most of our storms approach. The proverb, "Do business when the wind is north-west," alludes to the cool, dry, exhilarating condition of the air at the rear of a cyclone, when we no longer suffer from rheumatic and neuralgic annoyances.

A *secondary cyclone* may occur at the edge of a primary or true cyclone or at the edge of an anticyclone, and its course is usually parallel with that of the concentric system. It consists in a rounded loop in the isobars like a wide **U** and enclosing a low-pressure area. Such a loop in isobars between straighter ones brings the edges of the loop nearer the straight isobars, so that the gradient is steeper, and, consequently, the wind is stronger round the outside of the **U** than within it. The front of an advancing secondary cyclone is marked by halo and gloom; its outlying sides with straighter isobars, by cirrus; its loop, by gusty winds and heavy rain; its centre, by a steady downpour with calm air; and its rear, by irregular cumulus clouds. Thunderstorms commonly also accompany this form of the isobars, and may cause considerable and rapid barometric variation; but one of the chief peculiarities of secondary cyclones is the occurrence of continued rain with a steady (and not with a falling) barometer.

An *anticyclone* is an area of high pressure surrounded by more or less circular and wide-apart isobars. Such a system, unlike most cyclones, is often stationary for many days. The leading characteristic of the weather associated with it is calm, though round the outskirts of the anticyclone area we have cirrus cloud and light winds blowing spirally outwards with watch-hands. With this calm air or light winds we get what is known as *radiation weather*, weather, that is, when temperature and sky are mainly determined by the unobstructed radiation of the sun's heat by the earth. An anticyclone means fine settled weather. This allows the *diurnal variations* due to our earth's rotation and similar *local variations*, such as sea-breezes and land-breezes, to produce effects which are far more marked than they would be at any other time. In the summer, radiation weather is marked by early morning mists in the valleys, dispersing as the sun rises, and a very hot cloudless day, followed by sunset mists, heavy dew, and a cool night. In winter, the morning mists may be represented by fog; though the day become clear, it may, as the sun never rises high, remain cold and frosty, and the heavy dew may be replaced by rime; the diurnal variation in the direction of what little wind there is, the "veering with the sun," or becoming more southerly and westerly as the day advances, which is generally recognised as a sign of fine weather. Other popular anticyclone prognostics are: "if mists soon vanish," "if dews continue heavy in hot weather," "if sea-birds fly far out to sea, or rooks far from home," or "if bats fly about soon after sunset," the weather is likely to remain fine.

Unlike a secondary cyclone or a **V**, a *wedge*, or wedge-shaped isobar, has an area of high pressure between its arms. Such a wedge will lie between two cyclones, travelling onwards with them, and in our latitudes will point generally northward, so that between the two cyclones is a line, known as the *crest of the wedge*, broadly speaking at right angles to the path of the cyclones, along which the barometer is at its highest. Unlike an anticyclone, a wedge is never stationary; so that the changes of weather that accompany it are only temporary. As a northward-pointing wedge comes on from the west, the wind on its front or eastern side will be north-westerly, the sky will be blue, the air dry, the day beautifully fine, the sun burning, distant objects clearly visible, and the glass rising. At night, we may have one of those white frosts which popular weather-lore tells us never last more than three days, or we may see, as mentioned in the "grand old ballad of Sir Patrick Spence," "the new moone wi' the auld moone in hir arme," the earth-shine or reflection, that is, of the earth on the dark part of the moon. Then, while the barometer is still rising, halos are formed and stripes of cirrus cloud, popularly known as "Noah's Ark," make their appearance. A thunderstorm or heavy shower may follow; and then, while the glass begins to fall, the sky is overcast, the wind backs to south-west, and drizzling rain marks the passage of the wedge into the cylone that follows it.

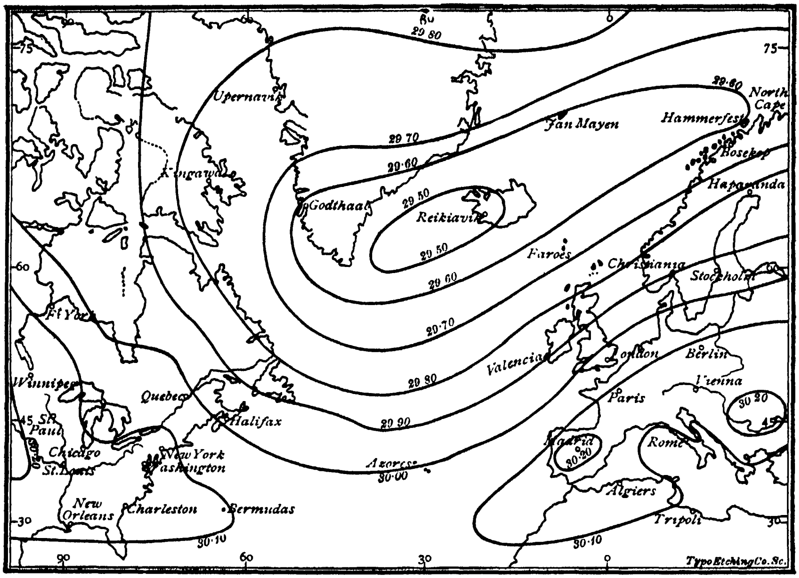

Fig. 13.—Map showing Cyclone over Iceland and small Anticyclones over Spain and the Danube.

Straight isobars are generally but a temporary condition marking the approach of a cyclone. In the neighbourhood of the highest pressure the sky will be blue; but as we approach the lower pressure, feathery cirrus will occur and a blustering wind, whirling the dust and beating down the smoke; distant objects will appear as visible while the sky is cloudy as they do in the clear weather at the approach of a wedge, and distant sounds will be strikingly audible. Still nearer to the lowest pressure, the clouds collect into firm strato-cumulus from behind which the sun's rays may stream down, often with a lurid light, which effect is commonly known as "the sun drawing water." Though when the isobars are straight, we generally say that the wind is keeping off the rain, we do sometimes have light showers if the gradients are very steep; but in any case, rain is likely to come soon, as the straight isobars pass into a cyclonic system.

In the temperate zone the weather is far more complexly variable, or, as we feel tempted to say, more capricious, than in the tropics; yet it is said that in the British Isles and Western Europe there are four types of weather, known, from the wind that prevails in each of them, as the southerly, westerly, northerly, and easterly.

The *southerly type* is most common and persistent in winter, its persistence rendering a winter mild. It consists in a stationary anticyclone to the east or south-east of Britain, cyclones from the Atlantic passing it towards the north-east.

The *westerly type*, the commonest at all seasons and throughout temperate regions, is when the tropical belt of anticyclones lies to the south of Britain whilst cylones from the Atlantic travel eastward or north-eastward, either traversing Britain and bringing gales in autumn, winter, or spring, or passing away northward and giving us fine dry weather or even drought.

The *northerly type*, the converse of the southern type, rarely occurring in autumn, consists mainly in an anticyclone over Greenland and the northern Atlantic, whilst cyclones form over Northern Europe and secondaries over England.

Lastly, the *easterly type* consists in an anticyclone over Scandinavia, whilst cyclones pass it south-eastward, eastward, or sometimes westward. This type is most frequent in winter and spring and least so in autumn. In the British Isles it often persists for two or three weeks continuously, accompanied by destructive easterly gales, to which, indeed, are due nearly one-half of the wrecks off our coasts.

GREEK.—XXIII.

[*Continued from p.* 230.]

VERBS IN -μι TREATED IN DETAIL.

HAVING given the general form of the verbs in -μι, we will now pass them in review, dividing them into certain classes, and thus affording aid to fix them, with their several parts, firmly in the memory. First of all come

VERBS IN -μι WHICH SET THE PERSON-ENDINGS IMMEDIATELY TO THE STEM-VOWEL.

Verbs in α-, *as* ἵ-στη-μι (ΣΤΑ-).

1. κί-χρη-μι, *I lend* (ΧΡΑ-), κιχράναι, fut. χρήσω, aor. ἔχρησα; mid. *I borrow*, fut. χρήσομαι (aor. ἐχρησάμην was in this sense avoided by the Attics). To the same theme belongs—
2. χρή, *it is necessary*, *it behoves* (*oportet* in Lat.), stem ΧΡΑ- and ΧΡΕ-; subj. χρῇ, inf. χρῆναι, part. (τὸ) χρέων, imperf. ἐχρῆν *or* χρῆν, opt. χρείη (from ΧΡΕ-), fut. χρήσει.
3. ἀπόχρη, *it is sufficient* (Lat. *sufficit*), else formed regularly from ΧΡΑΩ; inf. ἀποχρῆν, part. ἀποχρῶν, -ῶσα, -όν; imperf. ἀπέχρη; fut. ἀποχρήσει; aor. ἀπέχρησε(ν); mid. ἀποχρῶμαι, *I consume*, *I waste*. ἀποχρῆσθαι follows χράομαι.
4. ὀνίνημι (with acc.), *I am useful*, *I benefit* (ΟΝΑ-), inf. ὀνινάναι (the imperfect is wanting); fut. ὀνήσω; aor. ὤνησα; mid. ὀνίναμαι, *I have an advantage*, fut. ὀνήσομαι; aor. ὠνήμην, -ησο, -ητο, and so on; imper. ὄνησο; part. ὀνήμενος, opt. ὀναίμην, -αιο, -αιτο, inf. ὄνασθαι; aor. pass. ὠνήθην, less frequently ὠνήμην. The other parts are supplied by ὠφελεῖν, *to benefit*.
5. πί-μ-πλη-μι (ΠΛΑ-), *I fill;* inf. πιμπλάναι; imperf. ἐπίμπλην; fut. πλήσω; perf. πέπληκα; aor. ἔπλησα; mid. *I fill for myself*, πίμπλαμαι, πίμπλασθαι; imperf. ἐπιμπλάμην; fut. πλήσομαι; aor. ἐπλησάμην, perf. mid. or pass. πέπλησμαι; aor pass. ἐπλήσθην.

   (The μ in the reduplication of this and the following verb is commonly dropped in combination when a μ comes before the reduplication, as ἐμπίπλαμαι, but ἐνεπιμπλάμην.)
6. πίμπρημι, *I burn* (trans.), quite like πίμπλημι; πρήσω, ἔπρησα, πέπρηκα, πέπρησμαι, ἐπρήσθην, πεπρήσομαι.
7. ΤΛΗΜΙ, *I bear* (the present and the imperfect are wanting, for which are used ὑπομένω, ἀνέχομαι), aor. ἔτλην, τλῶ, τλαίην, τλῆθι, τλῆναι, τλάς; fut. τλήσομαι; perf. τέτληκα; verb. adj. τλητός. In Attic prose this verb is rarely found.
8. φη-μί, *I say* (ΦΑ-), is formed thus :—

Active.

	PRESENT.		IMPERFECT.
Ind. *Sing.* 1.	φημί.	Ind. *Sing.* 1.	ἔφην.
2.	φής.	2.	ἔφησθα *or* ἔφης.
3.	φῆσί(ν).	3.	ἔφη.
Dual. 2.	φᾰτόν.	*Dual.* 2.	ἔφᾰτον.
3.	φᾰτόν.	3.	ἐφάτην.
Plur. 1.	φᾰμέν.	*Plur.* 1.	ἔφᾰμεν.
2.	φᾰτέ.	2.	ἔφᾰτε.
3.	φᾱσί(ν).	3.	ἔφᾰσαν.
Subj.	φῶ, φῇς, φῇ, φῆτον, φῶμεν, φῆτε, φῶσι(ν).	Opt.	φαίην, φαίης, φαίη, φαίητον *and* φαῖτον. φαιήτην *and* φαίτην. φαίημεν *and* φαῖμεν, φαίητε *and* φαῖτε, φαῖεν.
Imp.	φάθι, φάτω, φάτον, φάτων, φάτε, φάτωσαν *and* φάντων.		
Inf.	φάναι.	Fut.	φήσω.
Part.	(φάς, φᾶσα, φάν; G. φάντος, φάσης, etc., not Attic.)	Aor.	ἔφησα.

Passive.

Perf. Imp. πεφάσθω, *let it be said.* Verb. Adj. φατός, φατέος.

In compounds we have ἀντίφημι, *I speak against*, and σύμφημι, *I speak with*, *agree*. φημί has a double meaning—first, *to say*, in general, and then to say *yes*, *to affirm* (in Lat. *aio*, I say *ay*).

Here belong the following deponents :—

1. ἄγαμαι, *I admire;* imperf. ἠγάμην, aor. ἠγάσθην, fut. ἀγάσομαι.
2. δύναμαι, *I am able*, *I can;* subj. δύνωμαι; imper. δύνασο; inf. δύνασθαι; part. δυνάμενος; imperf. ἐδυνάμην and ἠδυνάμην, ἐδύνω, etc.; opt. δυναίμην, δύναιο; fut. δυνήσομαι; aor. ἐδυνήθην, ἠδυνήθην, and ἐδυνάσθην; perf. δεδύνημαι; verbal adj. δυνατός, *being able* and *possible.*
3. ἐπίσταμαι, *I know*, *I understand*, ἐπίστασαι, etc.; subj. ἐπίστωμαι; imper. ἐπίστω, etc.; imperf. ἠπιστάμην, ἠπίστω, etc.; opt. ἐπισταίμην, ἐπίσταιο, etc.; fut. ἐπιστήσομαι; aor. ἠπιστήθην; verbal adj. ἐπιστητός.
4. ἔραμαι, *I love* (in the pres. and imperf. ἐρ(ά)ω is used in prose); aor. ἠράσθην (Lat. *amavi*), *I loved;* fut. ἐρασθήσομαι (*amabo*), *I shall love.*
5. κρέμαμαι, *I hang*, *depend* (Lat. *pendeo*)*;* subj. κρέμωμαι, imperf. ἐκρεμάμην, opt. κρεμαίμην, -αιο, -αιτο; aor. ἐκρεμάσθην; fut. perf. κρεμασθήσομαι, *I shall be hanged;* fut. mid. κρεμήσομαι, *I shall hang* (Lat. *pendebo*).
6. πρίασθαι, *to buy*, ἐπριάμην, 2 pers. ἐπρίω, a defective aorist middle employed by the Attics instead of the aorist of ὠνέομαι, namely, ἐωνησάμην, which they did not use; subj. πρίωμαι; opt. πριαίμην, -αιο, -αιτο; imperat. πρίω; part. πριάμενος.

VERBS IN ε-, AS τι-θη-μι (ΘΕ-).

Ἵ-η-μι (Ἡ- instead of Ἑ-), *I send.* Many forms of this verb occur only in compounds.

Active.

Pres. Ind. *ἵημι, ἵης, ἵησι(ν), ἵετον, ἵεμεν, ἵετε, ἱᾶσι(ν).*
Subj. *ἵω, ἵῃς, ἵῃ, ἵητον, ἱωμεν, ἵητε, ἵωσι; ἀφιώ, ἀφιῇς,* etc.
Imp. *ἵει, ἱέτω,* etc.; inf. *ἱέναι*; part. *ἱείς, ἱεῖσα, ἱέν.*
Impf. Ind. *ἵειν* (from ἹΕΩ). *ἵεις, ἵει, ἵετον, ἱέτην, ἵεμεν, ἵετε, ἵεσαν* (also *ἵην* in *ἠφίην*). Opt. *ἱείην.*
2 Perf. Act. *εἷκα, ἀφεῖκα*; pluperf. *εἵκη*; fut. *ἥσω*; 1 aor. *ἧκα, ἀφῆκα*; the indicative singular is supplied by the first aorist; D. *εἷτον* (*ἀφεῖτον*), *εἵτην*; plur. *εἷμεν* (*καθεῖμεν*), *εἷτε* (*ἀνεῖτε*), *εἷσαν* (*ἀφεῖσαν*); subj. *ὧ* (*ἀφῶ*), *ᾗς* (*ἀφῇς*), etc.; opt. *εἵην, εἵης, εἵῃ*; *εἷτον* (*ἀφεῖτον*), *εἵτην*; *εἷμεν* (*ἀφεῖμεν*), *εἷτε* (*ἀφεῖτε*), *εἷεν* (*ἀφεῖεν*); imperat. *ἕς, ἄφες, ἕτω*; *ἕτον* (*ἄφετον*), *ἕτων*; *ἕτε* (*ἄφετε*), *ἕτωσαν* and *ἕντων*; inf. *εἷναι, ἀφεῖναι*; part. *εἵς, εἷσα, ἕν*; G. *ἕντος, εἵσης*; *ἀφείς, ἀφεῖσα, ἀφέν, ἀφέντος*; etc. The augment of *ἀφίημι* follows the analogy of those verbs in which the two compounds have coalesced so as to produce one idea.

Middle.

Pres. Ind. *ἵεμαι, ἵεσαι, ἵεται,* etc.; subj. *ἱῶμαι, ἀφιῶμαι, ἱῇ, ἀφιῇ,* etc.
Imp. *ἵεσο* or *ἵου*; inf. *ἵεσθαι*; part. *ἱέμενος, -η, -ον.*
Imperf. *ἱέμην, ἵεσο,* etc.; opt. *ἱοίμην* (*ἱείμην*), *ἱοῖο, ἀφιοῖο.*
2 Aor. Ind. *εἵμην*; *εἷσο, ἀφεῖσο*; *εἷτο, ἀφεῖτο*; subj. *ὧμαι, ἀφῶμαι, ᾗ, ἀφῇ, ἧται, ἀφῆται*; opt. *προοίμην, -οῖο, -οῖτο, -οίμεθα,* etc.; imper. *οὗ* (*ἀφοῦ, προοῦ*), *ἕσθω,* etc.; 2 plur. *ἕσθε* (*ἀφέσθε, προέσθε*); *εἵμεθα,* etc.; inf. *ἕσθαι*; part. *ἕμενος, -η, -ον.*
Perf. *εἷμαι, μεθεῖμαι*; inf. *εἷσθαι, μεθεῖσθαι*; plup. *εἵμην, εἷσο, ἀφεῖσο,* etc.; fut. *ἥσομαι*; 1 aor. *ἡκάμην* only in the indicative, and rarely.

Passive.

1 Aor. *εἵθην, ἑθῶ, ἑθῆναι,* etc.; fut. *ἑθήσομαι*; verbal adj. *ἑτέος, ἀφετός.*

Εἰμί (stem ΕΣ-), *I am*, and εἶμι (stem Ι-), *I go.*

The conjugation of *εἰμί, I am*, has been given already when we began our consideration of the verb. We subjoin that of *εἶμι, I will go.*

Present.

	INDICATIVE.		SUBJUNCTIVE.
Sing.	1. εἶμι.	*Sing.*	1. ἴω.
	2. εἶ.		2. ἴῃς.
	3. εἶσι(ν).		3. ἴῃ.
Dual.	2. ἴτον.	*Dual.*	2. ἴητον.
	3. ἴτον.		3. ἴητον.
Plur.	1. ἴμεν.	*Plur.*	1. ἴωμεν.
	2. ἴτε.		2. ἴητε.
	3. ἴᾱσι(ν).		3. ἴωσι(ν).

Imperfect.

	INDICATIVE.		OPTATIVE.
Sing.	1. ᾔειν *or* ᾖα (παρῇα), *I went.*	*Sing.*	1. ἴοιμι *or* ἰοίην.
	2. ᾔεις *or* ᾔεισθα.		2. ἴοις.
	3. ᾔει.		3. ἴοι.
Dual.	2. ᾔειτον *or* ᾖτον.	*Dual.*	2. ἴοιτον.
	3. ᾐείτην ,, ᾔτην.		3. ἰοίτην.
Plur.	1. ᾔειμεν ,, ᾖμεν.	*Plur.*	1. ἴοιμεν.
	2. ᾔειτε ,, ᾖτε.		2. ἴοιτε.
	3. ᾔεσαν ,, ᾖσαν.		3. ἴοειν.

	IMPERATIVE.
Sing.	2. ἴθι, πρόσιθι.
	3. ἴτω.
Dual.	2. ἴτον, πρόσιτον.
	3. ἴτων.
Plur.	2. ἴτε, πρόσιτε.
	3. ἴτωσαν *or* ἰόντων.

Inf. ἰέναι.
Part. ἰών, ἰοῦσα ἰόν, G. ἰόντος, ἰούσης (παριών, παριοῦσα, παριόν, G. παριόντος).

Verb. Adj. ἰτός, ἰτέος.

VOCABULARY.

Ἄπειμι, I am away from, I am distant.
Ἄπειμι, I go from, I go away.
Ἀρκέομαι (in aor. pass., with dat.), I satisfy myself.
Ἀφίημι, I send forth, allow to go, set free, cease, omit, give up.
Δέον (from δεῖ), τό, what is due, duty.
Δῆθεν, namely (in Lat. *scilicet, scire licet*), that is to say.
Διογένης, -ους, ὁ, Diogenes.
Εἴσειμι, I go in, I come in.
Ἐμβροχίζω, I drive into a snare, a net (βρόχος, a snare).
Ἐξίημι, I send out; (of a river) to pour forth, fall into.
Ἔπειτα, afterwards, in the second place.
Ερυμάνθιος, -α, -ον, Erymanthine.
Ἐφίημι, I send to, I send for; *mid.* (with gen.), I desire.
Καθίημι, I let down.
Καρτερός, -ά, -όν, strong, powerful.
Κραυγή, -ῆς, ἡ, a cry.
Λίθος, -ου, ὁ, a stone.
Μεθίημι, I send after, I loose.
Νεῖλος, -ου, ὁ, the Nile.
Παρασκευάζω, I prepare; *mid.* I prepare myself.
Παρίημι, I send by.
Πέδη, -ης, ἡ, a fetter (πούς, a foot).
Πλεονάκις, often.
Πρόσειμι, I go to, I approach.

Στόμα, στόματος, τό, mouth, mouth of a river.

Τιμωρέω, I help; *mid.* (with acc.), I help myself, I avenge myself on.

Φανερός, -ά, -ον, manifest, known.

Χιών, χιόνος, ἡ, snow.

EXERCISE 125.

Translate into English :—

1. Οἱ ἀγαθοὶ οὐ διὰ τὸν ὕπνον μεθίασι τὰ δέοντα πράττειν. 2. Μὴ δίωκε τὰ ἀφανῆ ἀφεὶς τὰ φανερά. 3. Πολλοὶ ἄνθρωποι ἐφίενται πλούτου. 4. Πέδας λέγουσιν εἰς τὸν Ἑλλήσποντον καθεῖναι Ξέρξην, τιμωρούμενον δῆθεν τὸν Ἑλλήσποντον. 5. Οὔτ' ἐκ χειρὸς μεθέντα καρτερὸν λίθον ῥᾷον κατασχεῖν, οὔτ' ἀπὸ γλώττης λόγον. 6. Ἡρακλῆς τὸν Ἐρυμάνθιον κάπρον διώξας μετὰ κραυγῆς εἰς χιόνα πολλὴν παρείμενον ἐνεβρόχισεν. 7. Ὁ Νεῖλος ἐξίησιν εἰς τὴν θάλατταν ἑπτὰ στόμασιν. 8. Ἅττα ἔπειτ' ἔσται, ταῦτα θεοῖς μέλει. 9. Εἰ θνητὸς εἶ, βέλτιστε, θνητὰ καὶ φρόνει. 10. Μέμνησο νέος ὤν, ὡς γέρων ἔσῃ ποτέ. 11. Δίκαιος ἴσθ', ἵνα καὶ δικαίων τύχῃς. 12. Βίας παρούσης, οὐδὲν ἰσχύει νόμος. 13. Εὐδαίμων εἴην καὶ θεοῖς φίλος.

EXERCISE 126.

Translate into Greek :—

1. Be thou. 2. Let him go. 3. Let me be. 4. I wish I were. 5. Desiring. 6. Going. 7. Let them be. 8. Let them go. 9. Do you go. 10. Be thou good. 11. Be ye good. 12. Let them be good. 13. I send out. 14. You let down. 15. They approached. 16. I will go. 17. They will go. 18. Thou wentest. 19. They two went. 20. The good man will never omit to do his duty. 21. Many desire the unknown, giving up the known. 22. Xerxes let fetters down into the Hellespont. 23. Not by the tongue but by deeds may a man become my friend. 24. Be ye just, that ye may obtain justice. 25. A friend cares for his friend even when absent. 26. When the enemies came into the city, the citizens fled. 27. Begone, O boys. 28. The soldiers must leave the city. 29. Two armies came into our native land.

VERBS IN -μι WHICH, AFTER ADDING THE SYLLABLE ννῡ OR νῡ TO THE STEM-VOWEL, APPEND THE PERSONAL ENDINGS.

We give here the formation of the verbs in α, ε, ο, and of those whose stem terminates in a consonant :—

(*a*) *Verbs with a Stem ending in* α, ε, ο (ω).

Active.

Pres.	σκεδά-ννῡ-μι, *I scatter.*	κορέ-ννῡ-μι, *I satisfy.*	στρώ-ννῡ-μι, *I spread out.*
Imp.	ἐ-σκεδά-ννῡ-ν.	ἐ-κορέ-ννῡ-ν.	ἐ-στρώ-ννῡ-ν.
Perf.	ἐ-σκέδᾰ-κα.	κε-κόρε-κα.	ἔ-στρω-κα.
Plup.	ἐ-σκεδά-κη.	ἐ-κε-κορέ-κη.	ἐ-στρώ-κη.
Fut.	σκεδά-σω.	κορέ-σω.	στρώ-σω.
	Attic σκεδῶ, -ᾷς, -ᾷ.	Attic κορῶ, -εῖς, -εῖ.	
Aor.	ἐ-σκέδᾰ-σα.	ἐ-κόρε-σα.	ἔ-στρω-σα.

Middle.

Pres.	σκεδά-ννῠ-μαι.	κορέ-ννῠ-μαι.	στρώ-ννῠ-μαι.
Imp.	ἐ-σκεδα-ννύ-μην.	ἐ-κορε-ννύ-μην.	ἐ-στρω-ννύ-μην
Perf.	ἐ-σκέδα-σ-μαι.	κε-κόρε-σ-μαι.	ἔ-στρω-μαι.
Plup.	ἐ-σκεδά-σ-μην.	ἐ-κε-κορέ-σ-μην.	ἐ-στρώ-μην.
Fut.		κορέ-σομαι.	
Aor.		ἐ-κορε-σάμην.	
3 Fut.		κε-κορέ-σομαι.	

Passive.

Aor.	ἐ-σκεδά-σ-θην.	ἐ-κορέ-σ-θην.	ἐ-στρώ-θην.
Fut.	σκεδα-σ-θήσομαι.	κορε-σ-θήσομαι.	στρω-θήσομαι.

Verbal Adj. σκεδαστός, σκεδαστέος ; κορεστός, κορεστέος ; στρωτός, στρωτέος.

Another form of the present and imperfect is, σκεδα-ννύω, ἐ-σκεδά-ννυον ; κορε-ννύω, ἐ-κορέ-ννυον ; στρω-ννύω, ἐ-στρώ-ννυον ; the υ being always short.

(*b*) *Verbs with a Stem terminating in a Consonant,* as ὄλ-λυ-μι (ΟΛ-), *I destroy*, and ὄμ-νῡ-μι (ΟΜ-), *I swear.*

		Act.	*Mid. and Pass.*
Pres.	ὄλ-λῡ-μι (Lat. *perdo*). ὄλ-λῠ-μαι (*pereo*).	ὄμ-νῡ-μι.	ὄμ-νῠ-μαι.
Imp.	ὤλ-λῡ-ν.	ὤμ-νῡ-ν.	ὠμ-νύ-μην.
1 Perf.	ὀλ-ώλε-κα (ΟΛΕΩ), *perdidi.*	ὀμ-ώμο-κα (ΟΜΟΩ).	ὀμ-ώμο-σ-μαι.
2 Perf.	ὄλ-ωλ-α, *perii.*		
1 Plup.	ὠλ-ωλέ-κη, *perdideram.*	ὀμ-ωμό·κη.	ὀμ·ωμό-σ-μην.
2 Plup.	ὀλ-ώλ-ειν, *perieram.*		
Fut.	ὀλ-ῶ, -εῖς. ὀλ-οῦμαι, -ῇ.	ὀμ-οῦμαι, -ῇ.	
1 Aor.	ὤλε-σα.		
2 Aor.	ὠλ-όμην.	ὤμο-σα.	ὠμο-σάμην.
		1 A. P.	ὠμό-σ-θην.
		1 F. P.	ὀμο-σ-θήσομαι

Of the present and imperfect there is another form with the υ short, namely, ὀλλύ-ω, ὤλλυ-ον ; ὀμνύ-ω, ὤμνυ-ον.

The present, the first perfect, and the first pluperfect have a transitive signification—thus, pres. *I destroy*, 1 perf. *I have destroyed*, 1 plup. *I had destroyed ;* and the 2 perf. and 2 plup. have an intransitive meaning, as 2 perf. *I have perished* (*I am lost, it is all over with me*), 2 plup. *I perished.* The middle of ὄλλυμι (namely, ὄλλυμαι) signifies *I am perishing.*

(1) In particular instances belonging to this class of verbs the stem ends in a vowel, and takes ννῡ.

Verbs whose Stem ends in α.

1. κερά-ννῦ-μι, *I mix;* fut. κεράσω, Attic κερῶ; aor. ἐκέρᾰσα; perf. κέκρᾱκα; mid. *I mix for myself*, aor. ἐκερασάμην; perf. mid. or pass. κέκρᾱμαι; aor. pass. ἐκράθην (by metathesis), also ἐκεράσθην.
2. κρεμά-ννῦ-μι, *I hang;* fut. κρεμάσω, Attic κρεμῶ; aor. ἐκρέμᾰσα; mid. or pass. κρεμάννυμαι, *I hang myself* or *am hanged*, but κρέμᾰμαι, *I hang;* fut. pass. κρεμασθήσομαι; aor. ἐκρεμάσθην, *I was hanged* or *I hung* (intrans.).
3. πετά-ννῦ-μι, *I spread out, I open;* fut. πετάσω, Attic πετῶ; perf. mid. or pass. πέπτᾰμαι (by syncope), aor. pass. ἐπετάσθην.

Verbs whose Stem ends in ε.

1. ἕ-ννῦ-μι, *I clothe* (in prose ἀμφιέννυμι); imperf. ἀμφιέννυον, without augment; fut. ἀμφιέσω, Attic ἀμφιῶ; aor. ἠμφίεσα; perf. aor. wanting; perf. mid. or pass. ἠμφίεσμαι, ἠμφίεσαι, ἠμφίεσται, etc.; inf. ἠμφιέσθαι; fut. mid. ἀμφιέσομαι, Attic ἀμφιοῦμαι.
2. ζέ-ννῦ-μι, *I boil* (transitive), fut. ζέσω; aor. ἔζεσα; perf. mid. or pass. ἔζεσμαι; aor. pass. ἐζέσθην (ζέω is commonly intransitive).
3. σβέ-ννῦ-μι, *I extinguish*, fut. σβεσω; aor ἔσβεσα; 2 aor. ἔσβην, *I went out, I was extinguished;* perf. ἔσβηκα, *I have been put out;* mid. σβέννυμαι, *I go out;* perf. mid. or pass. ἔσβεσμαι; aor. pass. ἐσβέσθην. There is no other verb in -ννῦμι, except this, with a second aorist.
4. στορέ-ννῦ-μι, *I spread over*, fut. στορέσω, Attic στορῶ; aor. ἐστόρεσα.

Verbs whose Stem ends in ο, *lengthened into* ω.

1. ζώ-ννῦ-μι, *I gird*, fut. ζώσω; aor. ἔζωσα; mid. *I gird myself*, aor. ἐζωσάμην; perf. mid. or pass. ἔζωσμαι.
2. ῥώ-ννῦ-μι, *I strengthen;* fut. ῥώσω; aor. ἔῤῥωσα; perf. mid. or pass. ἔῤῥωμαι (ἔῤῥωσο, vale, *farewell);* inf. ἐῤῥῶσθαι; aor. pass. ἐῤῥώσθην.
3. στρώ-ννῦ-μι, *I spread out;* fut. στρώσω; aor. ἔστρωσα, etc. (*See* στορέννυμι.)
4. χρώ-ννῦ-μι, *I colour;* fut. χρώσω; aor. ἔχρωσα; perf. mid. or pass. κέχρωσμαι; imp. ἐχρώσθην.

(2) Verbs whose stem ends in a consonant and takes νῦ are the following:—

1. ἄγ-νῦ-μι, *I break;* fut. ἄξω; aor. ἔαξα; inf. ἆξαι; 2 perf. ἔᾱγα, *I have been broken;* aor. pass. ἐάγην.
2. εἴργ-νυ-μὶ (or εἴργω), *I restrain, enclose;* fut. εἵρξω; aor. εἶρξα; aor. pass. εἵρχθην; perf. mid. or pass. εἶργμαι.
3. ζεύγ-νῦ-μι, *I yoke, bind;* fut. ζεύξω; aor. ἔζευξα; mid. *I bind for myself;* aor. ἐζευξάμην; perf. mid. or pass. ἔζευγμαι; aor. pass. ἐζεύχθην, and more commonly ἐζύγην.
4. μίγ-νῦ-μι, *I mix;* fut. μίξω; aor. ἔμιξα, μῖξαι; perf. μέμῐχα; perf. mid. or pass. μέμιγμαι; aor. pass. ἐμίχθην, ἐμίγην; fut. pass. μιχθήσομαι, μιγήσομαι; 3 fut. μεμίξομαι.
5. ῥήγ-νῦ-μι, *I break, I tear;* fut. ῥήξω; aor. ἔῤῥηξα; 2 perf. ἔῤῥωγα, *I am broken;* aor. mid. ἐῤῥηξάμην; aor. pass. ἐῤῥάγην; fut. pass. ῥαγήσομαι.

INFLECTIONS OF THE TWO PRESENT-PERFECT FORMS, κεῖμαι, *I lie*, AND ἧμαι, *I sit*.

Perf. Ind. κεῖμαι, κεῖσαι, κεῖται, κείμεθα, κεῖσθε, κεῖνται; subj. 3 sing. κέηται; opt. κεοίμην, κέοιο, κέοιτο, etc.; imperat. κεῖσο, κείσθω, etc., inf. κεῖσθαι; part. κειμένος.
Plup. Ind. ἐκείμην, ἔκεισο, ἔκειτο, 3 plur. ἔκειντο.
Fut. κείσομαι.

Ἧμαι, *I sit*, is thus conjugated:—

Perf. Ind. ἧμαι, ἧσαι, ἧσται, ἧσθον; ἥμεθα, ἧσθε, ἧνται; imperat. ἧσο, ἥσθω, etc.; inf. ἧσθαι; part. ἥμενος.
Plup. ἥμην, ἧσο, ἧτο; ἧσθον, ἥσθην; ἥμεθα, ἧσθε, ἧντο.

(As the perfect form has a present meaning, so in both verbs the pluperfect is equivalent to the imperfect.)

Perfect. κάθημαι, κάθησαι, κάθηται; subj. καθῶμαι, καθῇ, καθῆται, etc.; opt. καθοίμην, κάθοιο, κάθοιτο; imperat. κάθησο; inf. καθῆσθαι; part. καθήμενος.
Pluperf. ἐκαθήμην *and* καθήμην, ἐκάθησο *and* καθῆσο, ἐκάθητο *and* καθῆστο.

VERBS IN -ω WHICH IN THE SECOND AORIST ACTIVE AND MIDDLE FOLLOW THE ANALOGY OF THE VERBS IN -μι.

Several verbs having the characteristics α, ε, ο, υ form a second aorist active and middle after the analogy of the formations in -μι, since those tenses want the mood-vowel, and append the person-endings immediately to the stem. All other parts of these verbs, however, follow the formations in -ω; thus—

βαίνω (ΒΑΩ), *I step*, has 2 aor. indic. ἔβην, imperat. βῆθι, subj. βῶ, opt. βαίην, infin. βῆναι; part. βάς.

σβέννυμι (ΣΒΕΩ), *I put out*, 2 aor. ἔσβην, imperat. σβῆθι, subj. σβῶ, opt. σβείην, inf. σβῆναι, part. σβείς.

γιγνώσκω (ΓΝΟΩ), *I learn*, 2 aor. ἔγνων, imperat. γνῶθι, subj. γνῶ, opt. γνοίην, inf. γνῶναι, part. γνούς.

δύω, *I cover*, 2 aor. ἔδῦν, imperat. δῦθι, inf. δῦναι, part. δύς (opt. and subj. follow the formation of verbs in -ω).

The formation of this second aorist active corresponds in all the moods and the participle to that of the second aorist active of the verbs in -μι. The characteristic vowel is lengthened throughout, as in ἔστην, ᾰ and ε being changed into η, ο into ω, and ῠ into ῡ, and so remains, as in ἔστην, through all the indicative, imperative, and infinitive. The imperative termination, -ηθι, in verbs with α for the characteristic vowel, is abridged into ᾱ, as πρόβᾱ instead of πρόβηθι.

In ordinary style the second aorist middle is found in very few verbs: as πέτομαι, *I fly;* πρίαμαι, *I purchase.*

VERBS WHICH FOLLOW THE FORMATION OF VERBS IN -μι.

Besides those already mentioned, there are several other verbs which form their tenses according to the analogy of the verbs in -μι. Such are:—

1. διδράσκω, *I ran away from;* aor. (ΔΡΑ-) ἀπέδρᾱν, -ᾱς, -ᾱ, -ᾱμεν, -ᾱτε, -ᾱσαν; subj. ἀποδρῶ, -δρᾷς, -δρᾷ, -δρῶμεν, -δρᾶτε, -δρῶσι(ν); opt. δραίην; imp. ἀπόδραθι, -άτω; inf. ἀποδρᾶναι; part. δράς, -ᾶσα, -άν.
2. πέτομαι, *I fly;* aor. (ΠΤΑ-) ἔπτην; imp. πτῆναι; pass. πτάς, act. mid. ἐπτάμην, imp. πτάσθαι (by syncope).
3. σκέλλω or σκελέω, *I dry, I dry up* (hence our *skeleton*); aor. (ΣΚΛΑ-) ἔσκλην, *I am dried up;* inf. σκλῆναι; opt. σκλαίην.
4. φθά-νω (with acc.), *I get before, I anticipate;* aor. ἔφθην, φθῶ, φθαίην, φθῆναι, φθάς.
5. καίω, *I burn* (transit.); aor. (ΚΑΕ-) ἐκάην, *I burnt* (intrans.), but 1 aor. ἔκαυσα (transit.), *I set on fire.*
6. ἁλίσκομαι, *I am taken, caught;* aor. (ʽΑΛΟ-) ἥλων and ἑάλων.
7. βιόω, *I live;* aor. ἐβίων; subj. βιῶ, -ῷς, -ῷ, etc.; opt. βιῴην (not βιοίην, as γνοίην, to distinguish this part from the opt. imperf. βιοίην); inf. βιῶναι; part. βιούς, -οῦσα (the neuter does not occur); the cases, however, are supplied by the 1 aor. βιώσας (so, ἀνεβίων, *I lived again*, from ἀναβιώσκομαι). The present and imperfect are little used by the Attics, instead of which they employ ζῶ (ζάω), which, on the other hand, borrows the remaining tenses from βιόω, thus:—Pres. ζῶ, imperf. ἔζων, fut. βιώσομαι, aor. ἐβίων, perf. βεβίωκα, perf. pass. βεβίωται, part. βεβιωμένος.
8. φύω, *I bring forth;* 2 aor. ἔφῡν, *I arose, came into being;* φῦναι, φύς, subj. φύω (no opt. in Attic), 1 aor. ἔφῡσα, *I brought forth;* fut. φύσω, *I shall bring forth.* The perfect πέφῡκα, *I have come into being, I have become*, is also intransitive. The mid. pres. φύομαι, fut. φύσομαι.

Particular attention must be paid to a verb of frequent occurrence, namely, οἶδα (stem ΕΙΔ-; *vid-eo* in Latin), *I know.*

PERFECT.

Ind. *S.* 1. οἶδα.	Subj. εἰδῶ.	Imperat.	Infinit.
2. οἶσθα.	εἰδῇς.	ἴσθι.	εἰδέναι.
3. οἶδε(ν).	εἰδῇ.	ἴστω.	
D. 2. ἴστον.	εἰδῆτον.	ἴστον.	Participle.
3. ἴστον.	εἰδῆτον.	ἴστων.	εἰδώς, -υῖα, -ός.
P. 1. ἴσμεν.	εἰδῶμεν.		
2. ἴστε.	εἰδῆτε.	ἴστε.	
3. ἴσᾱσι(ν).	εἰδῶσι.	ἴστωσαν.	

	Sing.	*Dual.*	*Plur.*
Opt.	εἰδείην, -ης, -η.	εἰδείητον, -ήτην.	εἰδείημεν, -ητε, εἰδεῖεν.

PLUPERFECT.

	Sing.	*Dual.*	*Plur.*
Ind. 1.	ᾔδειν (Attic ᾔδη)		ᾔδειμεν.
2.	ᾔδεις and ᾔδεισθα or ᾔδησθα.	ᾔδειτον.	ᾔδειτε.
3.	ᾔδει or ᾔδη.	ᾐδείτην.	ᾔδεσαν.

FUTURE.

εἴσομαι, *I shall know* or *experience.*

(Of οἶδα there is this compound—σύνοιδα, *I am conscious*, inf. συνειδέναι, imp. σύνισθι, subj. συνειδῶ, etc.)

INVARIABLE WORDS.

The words which we have hitherto studied are susceptible of certain changes. We may next consider words which do not undergo change, or undergo change only to a small extent. Many of these have occurred in the course of these lessons, but it will be found useful to group some of them together.

PREPOSITIONS.

The prepositions require careful study, as on them, as well as on other invariable verbs, the sense very much depends; and we shall miss some of the most delicate shades of meaning if we do not familiarise our minds with the particular import and usage of the prepositions and the conjunctions.

Prepositions have a relation to *place*, and denote the direction of an action in regard to place. Thus, we say, "You go *from* home," "you go *to* home," "you go *round* the house," "you go *over* the wall." In order, therefore, to possess an exact knowledge of the prepositions, of which there are in Greek eighteen, we must study them in their relation to place.

The Prepositions arranged in their Relations to Place.

RELATIONS TO PLACE.	GREEK.	ENGLISH.
1. Place *where* you are.	1. **ἐν,**	in.
2. Place *whither* you go	2. **εἰς** *or* **ἐς,**	into.
	3. **πρός,**	to.
3. Place *whence* you come.	4. **ἐκ** *or* **ἐξ,**	out of.
	5. **ἀπό,**	from.
4. Place *through* which you pass.	6. **διά,**	through.
	7. **ἀνά,**	up.
5. Place *at* which you stop. Place *down* which you go.	8. **κατά,**	down, at, on.
6. Different relations of position:—		
Place by the side of	9. **παρά,**	along.
,, together with	10. **μετά,**	with.
,, connected with.	11. **σύν** *and* **ξύν,**	with.
,, over	12. **ὑπέρ,**	over, above.
,, under	13. **ὑπό,**	under, by.
,, before	14. **πρό,**	before.
,, on both sides	15. **ἀμφί,**	around.
,, around	16. **περί,**	
,, on or upon	17. **ἐπί,**	on.
7. Opposition, displacement.	18. **ἀντί,**	against. instead of.

The following words may also be considered as prepositions, namely, **ἄτερ**, **ἄνευ**, *without*; **ἕνεκα**, *on account of*; **ἄχρι**, **μέχρι**, *up to*, *until*; **πλήν**, *but*, *except*; **μεταξύ**, *between*; but they differ from the above in that they cannot be compounded with verbs.

Prepositions are very frequently used in combination with verbs. Such verbs are then said to be *compounded* with prepositions. Thus, by the addition of the preposition **εἰς**, *into*, to the simple verb **ἄγω**, *I lead*, we get the compound verb **εἰσάγω**, *I lead into*. More than one preposition may combine with a verb: for example—

ἐξάγω, *I lead out* (an army from its camp).
παρεξάγω, *I lead out* (an army against the enemy).
ἀντιπαρεξάγω, *I lead out* (an army, and march it to assail the enemy).

ADVERBS.

Among the invariable or indeclinable words are adverbs. Adverbs qualify action in regard to—

(1) Place.
(2) Time.
(3) Manner or quality.
(4) Quantity.
(5) Interrogation.
(6) Affirmation.
(7) Negation.
(8) Doubt.

(1) *Adverbs of Place.*

One kind of adverbs of place is derived from the prepositions. The following will serve as examples:—

PREPOSITIONS.	ADVERBS.	MEANING.
1. **ἐν,**	**ἔνδον,** **ἔντος,**	*within.*
2. **εἰς,**	**εἴσω,**	*within* (with motion).
3. **πρός,**	**πρόσω,**	*forwards, in advance.*
4. **ἐξ,**	**ἔκτος,** **ἔξω,**	*outwards, externally.*

These adverbs are often found before a genitive, and so perform the part of prepositions; for example, **πόρρω τῆς πόλεως**, *far from the city*; **εἴσω τοῦ χάρακος**, *within the entrenchments*.

The following also may have a genitive, and others, which will be learned by practice, as:—**τῆλε**, *far off*; **πέρα** and **πέραν**, *on the other side of* (a river); **χωρίς**, *separately*; **πέλας**, **ἐγγύς**, **ἄγχι**, *near*.

There is another kind of adverbs which, by means of certain terminations, express the different relations of place:—

PLACE WHERE YOU ARE.	PLACE WHITHER YOU GO.
ποῦ, πόθι, *where?*	**ποῖ, πόσε,** *whither?*
ἐκεῖ, ἐκεῖθι, *there.*	**ἐκεῖσε,** *thither.*
οἴκοι, οἴκοθι, *at home.*	**οἰκόνδε,** *home.*
Ἀθήνησι, *at Athens.*	**ἀλλόσε,** *somewhere else.*
	Ἀθήναζε, *to Athens.*

PLACE WHENCE YOU COME.	PLACE THROUGH WHICH YOU PASS.
πόθεν, *whence.*	
ἐκεῖθεν, *thence.*	**πῇ,** *by what way.*
οἴκοθεν, *from home.*	**ἐκείνῃ,** *by that way.*
ἄλλοθεν, *from some other place.*	**ἄλλῃ,** *by some other way.*
Ἀθήνηθεν, *from Athens.*	

From this view you see that the terminations or particles—

-ου, -θι, -οι, -σι,	denote *the place where you are.*
-δε, -σε, -ζε, and sometimes **-οι**	,, ,, ,, *whither you go.*
-θεν	,, ,, ,, *whence you come.*
-ῃ	,, ,, ,, *through which you pass.*

-Ου is the termination of the genitive. Thus, **ποῦ** represents **ἐπὶ ποῦ τόπου**; *in what place?*

-Οι is the old form of the dative, so that **οἴκοι** is for **ἐν οἴκῳ**.

Ἀθήνησι is for **Ἀθήναις**, the dative of **Ἀθῆναι**. This ending applies particularly to the names of cities.

-Θεν appears to be an ancient form of the genitive. The poets say **σέθεν** for **σοῦ**, *of thee*; thus, **οἰκόθεν** is equivalent to **ἐξ οἴκου**.

-Ηι is the termination of the dative, **ὁδῷ** being understood; thus, **ἄλλῃ** is for **ἐν ἄλλῃ ὁδῷ**, *by another way.*

(2) *Adverbs of Time.*

The principal adverbs of time are the following:—

σήμερον, to-day (from ἡμερα, *a day*).
αὔριον, to-morrow.
χθές, yesterday.
προθές, the day before yesterday.
πρωί, in the morning.
ὀψέ, in the evening.
νῦν, νυνί, now.
πάλαι, of old, formerly.
οὔπω, not yet.
ἤδη, by this time.
ἔτι, yet, still.
ἄρτι, lately, but now.
αὐτίκα, immediately.
τότε, then.
ποτέ, some time.
θάμα, often.
ἀεί, always, successively.
οὔποτε, never.
πρίν, previously, before.
εἶτα, next, then.

(3) *Adverbs of Quality.*

Adverbs of quality end in -ως, and correspond to our adverbs in *-ly:—*σοφῶς, *wisely ;* πεπαιδευμένως, *learnedly ;* εὐδαιμόνως, *fortunately*.

To this class may be referred οὕτως (before a consonant, οὕτω), *thus, in this way*, from οὗτος; ἐκείνως, *in that way*, from ἐκεῖνος, *that person :* and in general all the adverbs ending in -ως.

Others have the form of the genitive or dative of the first declension :—

ἐξῆς (from obsolete nominatives), *forthwith.*
εἰκῆ „ „ „ *by chance.*
ἡσυχῆ (from ἥσυχος), *peacefully.*

Usage has suppressed the iota subscript as found in ἡσύχῃ ὅδῳ. Other adverbs of quality have the terminations -ει, -τι, -στι, and consequently resemble datives of the third declension :—

πανδημεί, *en masse, the whole people.*
ἀμαχητί, *without combat.*
ἑλληνιστί, *in the Greek language* or *manner.*

Some have the form of accusatives :—

μάτην (nominative obsolete), *in vain.*
δωρέαν „ „ *gratuitously.*

Those of this division in -δον and -δην correspond with the Latin adverbs in *-tim :—*

ἀγεληδόν (*gregatim*), *by flocks.*
κρυβδήν (*furtim*), *secretly.*

(4) *Quantity.*

The adverbs of quantity are susceptible of the same terminations as those of manner. Here are some of them :—ἄγαν, *too much ;* λίαν, *extremely ;* ἄδην, *abundantly ;* ἅλις, *sufficiently.*

Those which particularly mark number end in -ακις :—

ποσάκις (from πόσος, *how many?*), *how often? how many times?*
πολλάκις (from πολύς, *numerous*), *many times.*
τετράκις (from τέτταρες, *four*), *four times.*
πεντάκις (from πέντε, *five*), *five times.*

The rest of the adverbs formed from the cardinal numbers follow this analogy, except ἅπαξ, *once* (semel) ; δίς, *twice* (bis) ; τρίς, *three times* (ter).

(5) *Interrogation.*

ἦ asks a question simply: *Do you say this?* ἦ λέγεις τοῦτο ;

ἆρα asks a question mostly with an expressive *then, really :—Do you, then, say this?* ἆρα λέγεις τοῦτο ;

μῶν (μη οὖν) expects a negation, *num :* μῶν λέγεις τοῦτο ; *you do not say this, do you?* It is also used in simple interrogations.

(6) *Affirmation.*

ἦ, ἦ μήν, *yes, certainly, in truth.*

ἄρα, ῥά, τοί, δή (in the poets), *then, certainly, assuredly.*

μέν denotes a contrast, and strengthens, = *indeed* (quidem).

γε asserts something in addition, and gives emphasis to its word, = *at least.*

ναί (Latin *ne*, English *nay*), *yes, truly.*

(7) *Negation.*

οὐ (οὐκ before a vowel), οὐχί, Attic οὐδαμῶς, *by no means.*	*no*, with direct negations and indicative mood.
μή, οὐ μή, μὴ οὐχί μηδαμῶς *by no means.*	*that not*, with indirect negations and imperative mood.

(8) *Doubt.*

ἴσως, τάχα, που (without accent), *perhaps, probably.*

δήπου, δῆθεν, *apparently.*

There are some words which, without being adverbs, are employed adverbially. We have seen adverbs which have the form of the genitives, datives, and accusatives. We are now to see those cases themselves perform the office of adverbs. Their cases are said to be owing to certain prepositions which have been dropped in conversation :—

Gen.	νυκτός (διά), *by night, at night.*
Dat.	βίᾳ (σύν), *by force, forcibly.*
	κύκλῳ (ἐν), *in a circular, circularly.*
Acc.	δίκην (κατά), *in the form* or *manner of.*
	χάριν (πρός), *in favour of.*
	προῖκα (κατά), *gratuitously*

Sometimes the preposition is expressed and united to the noun : as—

παραχρῆμα (παρά, *at ;* χρῆμα, *the thing*), *at the moment.*
προὔργου (πρό, *for ;* ἔργον, *the deed*), *usefully, beforehand.*
ἐκποδών (ἐκ, *from ;* πούς, *the foot*), *at a distance, far from.*

Adverbs formed from adjectives imply a substantive:—

Dat. ἰδίᾳ (ἐν ἰδίᾳ χώρᾳ), *in particular;* πεζῇ (ἐν πεζῇ ὁδῷ), *on foot.*

Acc. μακράν (εἰς μακρὰν ὁδον), *a long way, at a distance.*

The neuter of the adjective is often employed as an adverb, as the dative πόλλῳ, *much, by much;* ἡδύ, *agreeably:* δεινόν and δεινά, *terribly;* πότερα, *whether?* ἐπιτηδές, *on purpose.*

KEY TO EXERCISES.

Ex. 128.—1 Even a slow man who is well advised can in pursuit catch a swift man. 2. The Athenians chose Themistocles general in the Persian war. 8. Ulysses came to the great hall of Hades. 4 Whatever lot you may have taken, bear it and chafe not at it 5. Do not trust very quickly before you exactly see the end. 6. Do not consider whether I am somewhat young to speak, but whether I speak the words of prudent men. 7. Mourn with moderation for friends who are dead, for they are not really dead, but they have gone before on the same road by which all must go.

Ex. 124.—1. Οἱ 'Αθηναῖοι πολλοὺς στρατιῶτας εἷλον 2. 'Η πόλις 'Επαμεινόνδαν εἵλετο στρατηγόν. 3. Θεμιστοκλῆς ὑπο τῶν 'Αθηναίων στρατηγος ῃρέθη. 4. 'Ελθε, ὦ φιλε. 5 'Ω ἀγαθοι φίλοι, ἔλθετε δεῦρο. 6. 'Εὰν πεινης, τοῦτο ἡδεως ἐδεῖ. 7. 'Ο παῖς οσον εἶχεν ἐδήδοκεν.

THE ORGANS OF SENSE.—XI.

[*Continued from p.* 242.]

V.—THE ORGAN OF TOUCH (*continued*).

In birds the place of hairs is supplied by feathers, The structure of these is very wonderful and beautiful, but a description would be out of place here, because they are certainly less efficient tactile organs than hairs. Birds' feathers are coarser than hairs; they are less flexible; they are inserted only on certain parts of the body; and since there must be provision made for moulting, they are more definitely cut off from the sensitive skin below. For all these reasons they are not good organs for transmitting the sense of touch, although they are formed in much the same manner as hairs. Probably on account of this inaptitude to transmit impressions, they are sometimes replaced by hairs in certain parts of the body; but as a rule the whole of the bird's body is encircled with feathers, which lie overlapping one another, and turned in one direction towards the tail of the bird, in the same manner as tiles on a house-roof. A bird's jaws, instead of being covered with soft, flexible, and sensitive lips, are covered with a hard, horny bill, and its legs, though often devoid of feathers, have to be defended by scales or scutes, to prevent the long tendons of their leg muscles being severed. Under these circumstances a bird enjoys little advantage from its sense of touch. Indeed, it is only in the padded under-surface of the foot and toes, and sometimes in the beak and tongue—when the former is leathery, and the latter not capped with horn—where there can be any provision for the exposure of a sensitive surface.

The cold-blooded animals (reptiles and fish) differ from the warm-blooded (mammals and birds) in having for the covering of their bodies no non-conducting or heat-retaining substances. Hairs and feathers are admirable retainers of heat; but scales and scutes, though good to resist blows and pressure, allow heat to pass out or in without much resistance. This, of course, is associated with the fact that in reptiles and fish the temperature varies with that of the surrounding medium. It does not follow, however, that because the body of a fish or lizard is entirely defended by scales, whose free edges overlap the insertions of those next behind them in a manner which is called "imbricated," that therefore they are entirely without the sense of touch. The scales are developed much as the human nails are, and we know that these are themselves insensible; yet they are so intimately connected with the sensitive parts by which they are formed, that the nails are the conductors of acute, and even morbid sensation. The *quick* of the nail is proverbially sensitive to pain; witness the common phrase of being wounded, or cut "to the quick." Reptiles, however, slough at certain seasons, and the old skin, dissevered from the cutis, adheres to them for some time—in fact, until a new and complete armour is formed below. During such periods, and inferentially at all times, the sense of touch cannot be acute. Scaled reptiles may be alive to blows or pressure, but hardly to those sensations of soft touch which convey the most distinct impressions of all to us. These remarks apply with yet more force to the hard, stony surface of the backs of crocodiles. The under side of the body of crocodiles is leathery rather than stony, and has fewer stony masses on its surface, and this is therefore sensitive. Sir Emerson Tennent gives an amusing account of a caiman, which he surprised before it could make its retreat. The Ceylon crocodile threw itself on its side, and feigned death; but when it was tickled under its arm it found the process too much for its gravity, and finally got up and hobbled away. As we before remarked in the article on Taste, the tongue is made use of by serpents and lizards to touch objects with; and this is probably its main, if not its only, use. In conformity with the assertion that nocturnal animals often have specially modified organs of touch, we find that certain nocturnal tree-snakes have their snouts prolonged into tactile organs.

The large majority of fish are completely invested by plates and scales. With few exceptions even the lips are hard and dry, so that they need to have some special organs of touch. Sometimes certain rays of the fins are detached from the oar-like parts, and become long styliform organs of touch. When this is the case, they are clothed with soft parts, which are well supplied with nerves. Thus, in the gurnet three soft rays are told off from the front of the pectoral fin, to form feeling fingers. It is curious that in a creature so far removed from man we have the same parts modified to the same use, though in almost all the intermediate animals this part has a different function. In the angler two rays detached from the back fin, and situated on the top of the head, have this function, but the use to which he puts these feelers is remarkable. One of the feelers has at its end a flattened, shining, and flexible adjunct, and this is used as a bait, just as a silver strip is used by the troller. The angler is rapacious, but sluggish ; he therefore lies on the bottom, with his huge ugly mouth wide open, and stirs up the mud with his fins to conceal himself, while he drops his sensitive bait before his mouth and keeps twitching it about, until he feels some hapless fish begin to nibble, when he makes a forward rush and closes his mouth upon him. The whole of each of the four limbs of the lepidosiren are converted into organs of touch. For the most part, however, the limbs of fish which correspond to our legs and arms are entirely devoted to locomotion, while quite new structures are developed for them to feel with. These special tactile organs are called barbules. They are placed on the head, and generally at the fore part of the jaws. When on or under the lower jaw they may be single ; but they are more often, and when on the upper jaw always, in pairs. Two instances are given in the illustration (lesson X): the one shows how they occur in an eel-like fish, and the other in an ordinary-limbed fish. The single medial barbule under the jaw of the cod is a familiar example. It is supposed that a cod which was blind when caught had obtained its food so well by the aid of this that it was quite in good condition. Barbules are well adapted to the purpose of touch. If in any other way nerves were conveyed through the scaly covering and exposed, these delicate structures would be liable to be injured by the impact of hard external bodies, which would be crushed between them and the hard and underlying scales ; but since the main nerve of these barbules accompanies a cartilaginous core, and since it springs from a single point to be spread upon a flexible pillar which hard bodies would drive before them, the chance of having the nerve crushed is much reduced. Barbules are for the most part found on the jaws of grovelling fishes like sturgeons and barbels, which feel along the bottom for all kinds of garbage which may have sunk there.

The mollusca have received their name from their general character of softness ; *mollis* being the Latin adjective for soft. This name was given them by Cuvier to contrast them with the hard-coated insects and crustacea, which belong to the sub-kingdom articulata or arthropoda. Hence in those species which are not provided with a shell, and in the exposed parts of those species which have this protection, there is a soft, sensitive skin. The skin, however, in this sub-kingdom has often superadded to the functions which it possesses in vertebrata the functions of respiration and of locomotion. Even those parts where the sense is more or less localised have so many other offices to which the sense is secondary or subservient, that it would lead us too far from our subject to describe them.. It is true that the gastropoda have horns as special tactile organs; but we find in the cephalopods the sense of touch is intimately combined in the arms with the elaborate apparatus for grasping and holding their prey ; and in the brachiopods the sense is united with the organs for breathing and keeping up currents in the water. We must therefore avoid going into details in reference to them. It may be stated generally that the slower an animal moves, and the more fixed its station, the more will its sense of touch be developed in proportion to the other senses. Hence the sense of touch is well developed throughout this sub-kingdom. Soft bodies are ill suited to energetic motion ; but soft bodies are well adapted to receive tactile impressions. In those animals of this sub-kingdom which are wholly fixed the organs of touch are multiplied; in the polyzoa there is a horseshoe-shaped or circular series of tentacles round the mouth, which are extremely sensitive. This arrangement of feelers around the mouth is so general a character of fixed animals, that there is a striking similarity between the outward form of these polyp-like creatures and the fixed animals of the sub-kingdom cœlenterata, although the essential organs are quite different.

The articulata (though some of them are soft-skinned) are for the most part covered with a hard horny covering, which is as resisting as plate armour. It is therefore necessary that these animals should havé special organs of touch. We have already referred to those of the lobster and its tribe in a former number. Insects have, developed from their heads and mouth-organs, jointed rods, which have nerves of touch running to them and up into them. These jointed rods are covered with hard horny matter, like the rest of the body; but sometimes the last joint exposes a naked membrane, and where this is not the case, the jointed and therefore flexible nature of the organs make them capable of receiving impressions of touch, and of measuring the dimensions and resistance offered by external objects. The normal number and position of these organs will be seen in the illustration (Fig. 14). There are two long many-jointed ones jutting from the head; these are called the antennæ. Another pair (or pairs) spring from the lower lateral jaws; they are called the maxillary palpi. Another pair (or pairs) spring from the sides of the lower lip; these are called the labial palpi. The soft-skinned spiders have no antennæ or labial palpi; but their maxillary palpi are so long and large as to look like legs.

The echinoderms, or sea-urchins, are so enclosed in their more or less spherical boxes of hard shell that a casual observer would suppose them to be unfeeling wretches, capable of inflicting wounds with their long spines, but insensible to softer emotions. This is not the case, however, for they can protrude through the small holes which perforate the shell and occupy five double meridional bands of their globular boxes, a multitude of soft, tubular, sucking feet, to each of which there runs a nerve.

The sea-anemone, with its streaming feelers, lives by feeling; and the whole sub-kingdom to which it belongs is characterised by animals with largely developed and multitudinous feelers.

Finally, those animals which we call protozoa, on account of the simple condition of their bodies, can manufacture from their jelly-like substance any number of long feelers. These they often render so branched and long as to give to the animals the name of "rhizopods," or "root-footed," because the feelers, which also perform the function of feet, look like the branching roots of a tree.

We have now set before our readers the principal facts connected with what are called in popular phraseology the "five senses"; and we have given, as far as was necessary, a description of the organs with which an all-wise and beneficent Creator has furnished His creatures, from the protozoa, the first link in the great chain of the animal kingdom, up to man, who stands but "a little lower than the angels," to enable them to see, hear, smell, taste, and touch—five great powers wonderfully contrived to administer to our pleasure and gratification, as well as to enable us to discharge the several functions that form the work which He has allotted to each on earth.

To enable the unscientific reader, and those even who can do little more than read, to follow us step by step, and appreciate and understand all that has been advanced, the description of each organ, its difference of formation in man and the lower animals, and the various purposes for which it serves, has been given in language which we have carefully sought to render as plain and clear and as free from technical terms as possible. When, however, it has been found absolutely necessary to use technical names—which are applied by scientific men for the sake of brevity of expression, and a ready means of distinguishing one animal or organ from another, by reference to some peculiarity that it possesses—the explanation of these terms has been supplied directly or indirectly in the papers in which they occur. The illustrations, too, that accompany the description of each organ of sense will be found as useful by our readers in enabling them to understand all that has been said of their formation, etc., as the map of a country or the chart of a sea is to him who would become acquainted with the physical configuration of the former, or the heights and abysses that lie hid from view beneath the waters of the latter. It may be as well to remind our readers that, in order to arrive at a thorough comprehension of everything that is advanced in our lessons on the Organs of Sense, they should be studied and mastered consecutively from the first to the last. Under the diagrams that accompany the lessons are given the technical names of the different parts of each organ under consideration.

SPANISH.—XIII

[Continued from p. 239.]

THE ADVERB (*continued*).

THERE can be no regular rules given for the position of the adverb; in most instances it may vary according to the taste of the writer. Some adverbs generally precede the verb: such are cuando, *when;* luego, *immediately;* apénas, *scarcely;* cuanto, *as much;* donde, *where;* and negative and interrogative adverbs.

Ella es muy ignorante, *she is very ignorant.*

He abrado muy neciamente, *I have acted very foolishly.*

Adverbs, like adjectives, admit of comparison; as—

Alaban mas á los muertos que á los vivos, *they praise more the dead than the living.*

Reciben mas alegremente que dan, *they receive more gladly than they give.*

The adverb *no* is sometimes used in comparisons in a manner that does not imply a negation, in which case it would be redundant in English, and might be properly omitted in Spanish; as—

Mejor es el buen nombre que no las riquezas. *Better is a good name than riches.*

Muy, *very, very much*, is used to qualify adjectives, participles, and other adverbs, but is never used to modify verbs. Mucho, *much, very much*, is used to qualify verbs and sometimes adverbs of comparison; as—

Ella es muy rica, *she is very rich.*
Para amar mucho al hombre, preciso es estimarle mucho, *in order to love a man much, it is necessary to esteem him much.*
Lucía lee muy bien, *Lucy reads very well.*
Te has hecho mucho mas poderoso que nosotros, *thou hast made thyself much more mighty than we.*

Muy is sometimes employed to qualify nouns, especially at the beginning of a note or letter addressed to any person; as—

Muy amigo mio, *very much my friend (dear friend).*
Muy señor mio, *very much my gentleman (dear sir).*

Bien, joined to adjectives or adverbs, is equivalent to *very;* as, bien rico, *very rich;* and to verbs, *much;* as, él bebió bien, *he drank much.*

Negative adverbs and all negations generally precede the verb; as—

Á ninguno dió el libro, *to no one gave he the book.*
No puede escribir, *he cannot write.*

If a word implying negation come after the verb, the adverb *no* must precede the verb; as—

No dió el libro á ninguno, *he gave the book to no one.*
No tiene nada, *he has nothing.*

From the last two rules it will be seen that in Spanish it can be said, nada tiene, *or* no tiene nada, *he has nothing;* á ninguno habló, *or* habló á ninguno, *he spoke to nobody;* ella nunca ha hablado, *or* ella no ha hablado nunca, *she has never spoken.*

Nunca, *never*, and jamas, *never*, are sometimes both used in a sentence to give additional force to the negation; as—

Nunca jamas tendrá sed, *Never, never will he be thirsty.*

Jamas, *never*, is used with siempre, *always*, in the sense of *ever and ever;* as—

Dios reina por siempre jamas, *God reigns for ever and ever.*

In interrogative sentences, *jamas* is rendered by *ever* in English; as, ¿ ha jamas hablado ? *has he ever spoken ?*

Si, *yes*, and no, *no*, when used after verbs in such sentences as *he replied no, they answered yes, I believe not*, take *que* before them in Spanish; as—

Respondió que si, *he replied yes.*
Creo que no, *I think not.*
Me dijeron que no, *they told me no.*

Si, *yes*, and no, *no*, serve to affirm or deny what is predicated in a preceding verb without repeating the verb; as—

Yo no sé nadar, y Juan si, *I know not how to swim, and John does* **(*yes*).**
Ella pueda cantar, pero yo no, *she can sing, but I cannot* (*no*).

Derivative adverbs are nearly all formed from adjectives, by suffixing *-mente*, which in Spanish corresponds to *-ly* added to adjectives in English; as—

Cierto; ciértaménte, *certain; certainly.*
Bastante; bastántemente; *sufficient, sufficiently.*

When more adverbs than one ending with *-mente* qualify the same verb, the suffix *-mente*, for the purpose of preventing a disagreeable repetition of sound, is placed to the last adverb only; as—

Mi ánimo es explicar lisa y llanamente, *My intention is to explain clearly and plainly.*

In all languages there are certain phrases used adverbially, the words of which, taken collectively, have an idiomatic meaning, but taken separatively would make no sense. Thus in English the adverbial locutions *by-and-by, at least, none at all*, would signify nothing intelligible if taken literally, word by word; but as adverbial phrases, they are very expressive. It is often thus in Spanish: a mere literal translation of the words will do little or nothing toward assisting us to comprehend the meaning. Such phrases will generally be found explained in their adverbial sense in dictionaries. Some of the most common are given in the following list:—

Á conciéncia, *conscientiously.*
Á la verdad, *truly.*
Á vista de ojos, *evidently, at a glance.*
Á sabiendas, *knowingly.*
Al seguro, *securely.*
Á buen seguro, *certainly.*
Ántes con antes, *as soon as possible.*
Ahora, ahora, *just now.*
Á mas correr, *with the utmost speed.*
Á mas tardar, *after great delay.*
Á la improvista, *unexpectedly.*
Á trechos, *at intervals.*
Á una, *together, in company.*
Á la continua, *continually.*
Á hecho, *indiscriminately.*
Al paso que, *in proportion as.*
Á pié, *on foot.*
Á buen hora, *early, seasonably.*
Á la hora, *at the nick of time.*
Algun tiempo hace, *some time since.*
Al revés, *wrong side outwards, on the contrary way.*
Á mas no poder, *with all one's might.*
Á la sordina, *noiselessly, slyly.*
Á escondidas, *or* á escondidillas, *secretly, stealthily.*
Al buen punto, *pointedly, opportunely.*
Á saltos y corcovos, *by fits and starts.*
Á la corta ó á la larga, *sooner or later.*
Al ojo, *at sight.*
Al punto, *instantly.*
Á tientas, *in a groping manner*
Á mas tirar, *to the utmost.*
Á tuerto ó á derecho, *right or wrong, hit or miss.*
Á secas y sin llover, *without preparation or advice.*
Á solas, *by oneself, in private.*
Á buena luz, *carefully, with due examination.*
Á dos luces, *ambiguously.*
Á trompa y talega, *helter-skelter, confusedly.*
Baxo mano, *in an underhand manner.*
Bien como, *just as.*
Casi casi, *very nearly.*
Cuanto ántes, *as soon as possible.*
Cuanto tiempo, *how long.*
Cuando ménos, *at least.*
Cuando mucho, *at most.*
De contado, *readily, immediately.*
De seguro, *of course.*
De cuando en cuando, *from time to time, now and then.*
De improviso, *unexpectedly, on a sudden.*
De aquí para allí, *to and fro, here and there.*
De ántes, *of old, of yore.*
De continuo, *continually.*
De intento, *purposely.*
De proposito, *on purpose.*
De hecho, *in fact, actually.*
De noche, *by night.*
De dia, *by day.*
De salto, *suddenly.*
De por si, *by oneself, apart.*
De silla á silla, *face to face.*
De tropel, *in confusion, pell-mell.*
De lance, *cheaply, secondhand.*
De consiguiente, *consequently.*
En conciéncia, *in good earnest.*
En especial, *especially.*
En seguida, *afterward.*
En tanto *or* entre tanto, *in the mean time, whilst.*
En alguna parte, ***somewhere.***

En ninguna parte, *nowhere.*
En otra parte, *elsewhere.*
En alguna otra parte, *somewhere else.*
En ninguna otra parte, *nowhere else.*
En cualquiera parte, *anywhere.*
En adelante, *forward, in the future.*
En lo sucesivo, *afterward, hereafter.*
El año que viene, *next year.*
En derechura, *by the most direct way.*
En resúmen, *in short, briefly.*
Hasta no mas, *to the highest pitch.*
Hasta que, *as far as.*
Hoy dia *or* hoy en dia, *now-a-days.*
Hoy por hoy, *this very day*
La semana pasada, *last week.*
La semana que viene, *next week.*
Mucho tiempo ha, *long time ago.*
Moñana á la noche, *to-morrow night.*
No bien, *no sooner, scarcely.*
No mucho ha, *not long since, a short time ago.*
Por atrás, *behind.*

Poco ha, *of late, lately.*
Poco á poco, *by degrees.*
Por el tanto, *on that ground, for the reason.*
Por entonces, *at that time.*
Por supuesto, *of course.*
Por puntos, *from one moment to another.*
Por salto, *on a sudden.*
Por lo largo, *along.*
Por razon, *consequently.*
Por fin, *finally.*
Por instantes, *incessantly.*
Por poco, *but little, nearly.*
Por aca ó por allá, *here or there.*
Por encima, *superficially.*
Pocas veces, *seldom.*
Rara vez, *not often, seldom.*
Rato ha, *short time ago.*
Sin suelo, *without bounds, to excess.*
Sobre seguro, *confidently, securely.*
Sin ton y sin son, *without rhyme or reason.*
Sobre manera, *excessively.*
Sobre sí, *separately, selfishly*
Tal vez, *perhaps, once at a time.*
Una vez, *once.*
Ya ha rato, *some time ago*

THE PREPOSITION.

The prepositions are employed in such a variety of ways in Spanish and in English, that each one is not always to be rendered from one language to the other by the same word. Thus, *de* is not always to be translated into English by *of*, nor *of* into Spanish always by *de*. The following observations will show the manner in which these prepositions are to be used :—

About, when it means *through*, is rendered by *por ;* when it means *on*, by *sobre ;* when it means *within*, by *en ;* when it means *of*, by *de ;* as—

Ella iba cantando por el lugar, *she went singing about the village.*
Locke escribió sobre el Christianismo, *Locke wrote about Christianity.*
Ellos están en el palácio, *they are about the palace.*
No habla de política en público, *he does not talk about politics in public.*

Above is rendered by *sobre ;* as—

El ave vuela sobre la tierra, *The bird flies above the earth.*

Against, meaning *in opposition to*, or *contrary to*, is rendered by *contra ;* as—

Ellos pelearon contra los Mojicanos, *they fought against the Mexicans.*
Contra la ley, *against the law.*

After, meaning *later in time*, is rendered by *despues de ;* when it means *according to*, by *á* or *segun ;* and when it means *immediately behind*, by *tras ;* as—

Despues de las seis, *after six o'clock.*
Á la moda francesa, *after the French fashion.*
Segun este modo, *after this manner.*
Echa la soga tras el caldero, *he throws the rope after the bucket.*

According to is rendered by *segun*, and sometimes by *para con ;* as—

Segun los ordenes de V., *according to the orders of your worship.*
Para con él no vale nada, *according to him it is worth nothing.*

Among, when it means *of the number of*, is rendered by *entre* or *para entre ;* when it means *in the midst of*, by *en médio de ;* and when it means *in*, by *en ;* as—

Entre los hombres no hay uno, que sea recto, *among the men there is not one that is upright.*
Para entre amigos los cumplimientos son escusados, *among friends compliments are unnecessary.*
Yo os envio como corderos en médio de lobos, *I send you as lambs among wolves.*
En muchas naciones no había rey semejante á él, *among many nations there was not a king like him.*

At, when it denotes *in* or *on*, is rendered by *en ;* when it denotes proximity, precedes the price of anything or the time of day, or means *in readiness for*, it is rendered by *á ;* as—

Ellos estan en casa, *they are at home.*
Ellos estan en paz, *they are at peace.*
Juan esta en Roma, *John is at Rome.*
Ellos estan en la mar, *they are at sea.*
Al puente, *at the bridge.*
A la mano, *at hand.*
A seis pesos la fanega, *at six dollars a bushel.*
Á las cuatro, *at four o'clock.*
Esta á mi mando, *he is at my command.*
Al trabajo, *at work.*

Before, meaning *in the presence of*, is rendered by *ante ;* meaning *in front of*, or the opposite of *behind*, by *delante de ;* meaning *precedent in rank*, or *previous in time* (that is, the opposite of *after*), by *ántes de ;* as—

La causa se llevará ante los jueces, *the cause will be brought before the judges.*
Iba delante de ellos para monstrar el camino, *he went before them to point out the way.*
Ántes del dia, *before day.*
Prostrado en tierra delante del arca del Señor, *prostrated on the earth before the ark of the Lord.*
Ántes de los Marqueses van los Duques, *the Dukes take rank before the Marquises.*
Ántes de anochecer, *before nightfall.*

Behind is rendered by *tras*, or *detras de ;* as—

Tras la puerta, *behind the door.*
Detras de ellos, *behind them.*

Below is rendered by *debajo de :* as—

Debajo del lábio, *Below the lip.*

Between is rendered by *entre ;* as—

Discernir entre lo bueno y lo malo, *To discern between the good and the evil.*

By, meaning *at* or *in*, is rendered by *de ;* meaning future time, *when*, by *para ;* meaning *close to*, or *alongside of*, by *junto á ;* and meaning *through*, by *por ;* as—

Sirvase V. sentarse junto á la ventana. *please to seat yourself by the window.*
Se ha hecho rico por malos médios, *he has made himself rich by wicked means*
Yo lo necesitaré todo para el sábado, *I shall need it all by Saturday.*
De dia, *by day.*
De noche, *by night.*

Concerning, meaning *about* or *in regard to*, is rendered by *acerca de* or *tocante á ;* as—

Acerca de lo que hemos hablado, *concerning that which we have spoken.*
Tocante á esta pendéncia, *concerning* (or *touching*) *this affair.*

For, meaning *during*, *on account of*, *for the sake* *of*, or *in behalf of*, *in exchange for*, *for the purpose of getting*, as *by* (per), is rendered by *por;* and when it means *for the use of*, or *with the intention of going to*, it is rendered by *para;* as—

¿Puede V. darme un cuarto por esta noche? *can you give me a room for this night?*
Piensan que por mucho hablar seran oidos, *they think that for much speaking they will be heard.*
Murieron por su pátria, *they died for their country.*
Le daré mi flauta por su violin, *I will give him my flute for his violin.*
Ir por dinero, *to go for money.*
Ella le recibio por esposo, *she received him for a husband.*
Para un principiante lo ha hecho bien, *for a beginner he has done it well.*
¿Cuánta por dia? *how much for a day?*
Lo he comprado para mi muger, *I have bought it for my wife*
Salio para España, *he set out for Spain.*

For is sometimes used in English when it would not be in Spanish; thus, I want to alight for a moment, *necesito bajar un momento.* *Por* is sometimes used in Spanish when it would be redundant in English; as, uno vale por muchos, *one is worth many.*

From, when it means *since*, or *from the time of*, and *of distance from*, is generally rendered by *desde;* in other cases by *de;* as—

Hay cincuenta millas desde Vera-Cruz á Jalapa, *it is fifty miles from Vera Cruz to Jalapa.*
¿Cuando ha vuelto V. del campo? *when did you return from the country?*
Desde la niñez aprendiste las sagradas letras, *from childhood thou hast known the Holy Scriptures.*

In, meaning *in the time of*, *within*, and *into*, is rendered by *en;* when it means *through the course of* or *during*, by *por;* and when, after superlatives or other adjectives, it means *of*, by *de;* as in these examples:—

Este bárrio es de los mejores de la ciudad, *this ward is one of the best in the city.*
En el invierno, *in the winter.*
Acre de génio, *austere in disposition.*
En España, *in Spain.*
Por la mañana, *in the morning.*

Instead of is rendered by *por*, and by *en lugar de* when it means *in the place of;* as—

Vino él por su padre,	*He came instead of his father.*
Arquelás reinaba en Judéa en lugar de Herodes su padre,	*Archelaus was reigning in Judea instead of Herod his father.*

Into, when it comes after the verb *enter*, and when it means *inside of*, is rendered by *en;* but after all verbs of motion (*to enter* excepted) it is rendered by *á;* as—

Entremos en este bosque,	*Let us enter into this grove.*
Eche V. aceite en la lámpara,	*Pour oil into the lamp.*
Vamos al comedor,	*Let us go into the dining-room.*

Of is rendered by *de;* as—

Un amigo del rey,	*A friend of the king*

On or *upon*, meaning *along*, is rendered by *en:* meaning *through*, by *por;* meaning *by*, it is rendered by *de;* and meaning *in contact with the upper surface of anything*, by *sobre;* as—

Nada debe afirmarse por una mera probabilidad, *nothing ought to be affirmed upon mere probability*
Está sobre la silla, *it is on* (or *upon*) *the chair.*
¿Hay peligro en el camino? *is there danger on* (or *upon*) *the road?*
El hombre no vive de solo pan, *man lives not on bread alone.*

Sometimes *on* is rendered by *á;* as, á caballo, *on horseback;* á pié, *on foot;* á bordo, *on board.* *Upon*, after the verbs *to count*, *rely*, etc., is rendered by *con;* as, conto con la amistad de Diego, *I rely upon the friendship of James.*

When *on* in English is used before the days of the week or month, it is not rendered in Spanish; thus, ella llegó allí el sábado, *she arrived there on Saturday.*

Out of, meaning *removed from*, *beyond and outside of*, is rendered by *fuera de;* meaning *on account of*, by *por;* meaning *from*, by *de;* as—

Fuera de mis alcances, *out of my power.*
Tengo habas que están fuera de tierra, *I have beans that are out of the ground.*
Por amistad, *out of friendship.*
Bebe de un vaso, *he drinks out of a tumbler.*
Fuera de peligro, *out of danger.*

Over is rendered by *encima de* when it means *above*, and otherwise by *sobre;* as—

Encima de la ventana, *over the window.*
Lloró sobre la ciudad, *he wept over the city.*

Through, meaning *from one end or side to another* or *on account of*, is rendered by *por;* when it means *by reason of*, by *de;* as—

Por el temor de la muerte estaban en servidumbre toda la vida, *through the fear of death they were in bondage all their lives.*
Viajó por España, *he travelled through Spain.*
Ella tiembla de temor, *she trembles through fear.*

Till is rendered by *hasta;* as—

La oficina está abierta hasta las diez de la noche,	*The office is open till ten o'clock at night.*

To, when preceded by *from*, in such phrases as *from bad to worse*, *from time to time*, is rendered by *en;* when it means *of*, by *de;* and in other cases generally by *á;* as—

De dia en dia, *from day to day.*
Un amigo de su patria, *a friend to his country.*
Un tio de Juan, *an uncle to John.*
Dió el tintero á María, *he gave the inkstand to Mary.*

Towards is rendered by *hácia;* as—

Aquí viene hácia nosotros la señora de la casa,	*Here comes towards us the lady of the house.*

Under is rendered by *debajo de* or *bajo;* as—

Debajo del puente,	*Under the bridge,*
Bajo la mesa,	*Under the table.*

Under is rendered by *so* in the following phrases:—

So capa de, *under cover of.*
So color de, *under colour of.*
So pena de, *under penalty of.*
So pretexto de, *under pretext of.*

With, when meaning *of*, or *from*, or *by*, is rendered by *de;* in most other cases by *con;* as—

Estamos cubiertos de polvo, *we are covered with dust.*
Nos morimos de frio, *we are dying of cold.*
Juan le mató de un sablazo, *John killed him with a sabre-stroke.*
Con permiso del capitan, *with permission of the captain.*

Within is rendered by *dentro de;* as—

Lo necesitaré dentro de tres dias,	*I shall need it within three days.*

Without, meaning *destitute of*, *with exemption* *from*, is rendered by *sin ;* and when it means *outside of*, or *beyond*, by *fuera de ;* as—

Tráteme V. sin ceremónia,	*Treat me without ceremony.*
Comprar sin dinero,	*To buy without money.*
Le echaron fuera de la ciudad,	*They cast him out of the city.*

Sin in Spanish is regarded as a negative preposition, and is therefore often followed by a negative conjunction ; as—

Sin otro fin ni motivo,	*Without another end or (nor) motive.*

There are other prepositions in Spanish which. as they can be rendered in most cases by the corresponding English preposition, offer no difficulty to the learner. Such are—

Para con, *in respect to.*
Además de, *besides.*
A pesar de, *in spite of, notwithstanding.*
Cerca de, *near to*
Frente á, *or* en frente de, *opposite.*
Durante, *during.*
En órden a, *with regard to.*
Junto á, *adjoining.*
Por el medio de, *across.*

The preposition entre, *between*, when it comes before personal pronouns, does not govern them in the objective case in Spanish, but is followed by them in the nominative ; as, entre tú y yo (and not *entre tí y mí*), *between thee and me.*

Prepositions, as in English, are placed before the word which they govern.

Care must be taken to distinguish the use of the same word in English, whether employed as a preposition, or an adverb, or conjunction. Thus, in the phrases *after breakfast*, *before dinner*, the words *after* and *before* are prepositions, and are to be rendered by *despues de* and *ántes de*, respectively ; while in the phrases *after I had departed*, *before I had dined*, the words *after* and *before* are adverbs, and are to be rendered by *despues que* and *ántes que.*

Segun, when used before a verb in Spanish, is not a preposition, but an adverb, meaning *according as;* as—

Segun creo, *according as I believe.*
Segun pareció, *according as it appeared.*

THE CONJUNCTION.

Conjunctions are simple—that is, such as consist of a single word; or conjunctive phrases—such as consist of more than one word. They may be divided according to their meaning into the following classes :—

1. *Copulative*, which simply unite words or sentences together; as, y, *and ;* tambien, *also.*

2. *Disjunctive*, which connect words or sentences at the same time that they disjoin the sense; as, ó, *or.*

3. *Adversative*, which express opposition of meaning while they connect; as, mas, *but ;* pero, *but ;* sin embargo, *notwithstanding.*

4. *Comparative*, which serve to compare words or prepositions; as, como, *as ;* así, *so ;* como si, *as if.*

5. *Conditional*, which express a condition ; as, si, *if ;* con tal que, *provided that.*

6. *Concessive*, which serve to express something granted; as, aunque, *even if ;* dado que, *granted that.*

7. *Conclusive*, which express a conclusion or inference ; as, de aquí, *hence ;* por esto, *therefore.*

8. *Causal*, which express a cause or reason ; as, porque, *because ;* pues que, *since.*

9. *Temporal*, which serve to express a relation of time ; as, ántes que, *before ;* despues que, *after.*

10. *Final*, which express an end or purpose ; as, para que, *that*, *in order that ;* á fin de que, *to the end that.*

MANNER OF USING CERTAIN CONJUNCTIONS.

Sino, meaning *but*, is used after a negative, unless the verb be repeated ; and *pero* or *mas*, also meaning *but*, is used when no negative precedes ; as—

El reino de Dios no está en palabras, sino en virtud,	*The kingdom of God is not in word, but in power.*
Ella es hermosa, pero (*or* mas) no es prudente,	*She is beautiful, but she is not prudent*

If after a negative the verb be repeated, *pero* or *mas* is to be used instead of *sino ;* as—

Ella no lo dijo a Juan, pero (*or* mas) lo dijo á Pedro,	*She did not tell it to John, but she told it to Peter.*

Sino, meaning *except*, is used after an interrogation or after a negative ; and *ménos*, also meaning *except*, is used when no interrogative or negative precedes, both words being rendered in English by *but ;* as—

¿ Quién lo hizo sino el carpintero?	*Who did it but the carpenter ?*
Ninguno hay bueno sino solo Dios,	*There is no one good but God alone.*
Vinieron todos ménos el juez,	*They all came but the judge.*

The conjunction *but* is used in English in such a variety of meanings that it is necessary, before rendering it into Spanish, to find what other word or words it really represents, as this latter word or phrase is generally that which is used to represent it in Spanish ; thus—

I am distant from death but (*only*) one step,	*Un solo paso disto yo de la muerte*
We have but (*no more than*) five loaves and two fishes,	*No tenemos mas de cinco panes y dos peces.*
He arrived but (*not till*) yesterday,	*No llegó hasta ayer.*
I cannot but (*do less than*) go,	*Yo no puedo ménos de ir.*
He has but (*done no more than*) gone (*i.e.*, he has but just gone),	*Él no ha hecho mas que irse.*
But (*if it were not*) for me, he would perish,	*Si no fuese por mí, él pereceria.*
There is no one of them but (*who is not*) is a general,	*No hay ninguno de ellos que no sea general.*
He went no day to the village but (*that not*) he returned drunk,	*Ningun dia fué al lugar que no volvió borracho.*

It will at once be perceived that the irregularity in the use of the word *but* is chargeable to the English, not the Spanish language. In the latter *but* is not used with ten different meanings as in English.

The conjunction *unless* is to be rendered in Spanish by *á ménos de que*, or by the word or words which it really represents ; as—

He will do nothing unless you speak (*may speak*) to him,	*Nada hará, á ménos de que V. le hable,*
No one can do these miracles unless (*if not*) God be (*should be*) with him,	*Ninguno puede hacer estos milagros, si Dios no estuviere con el.*

The conjunction *excèpt*, when it means the same as *unless*, is rendered in Spanish in the same manner ; and when it means privation—as, for instance, in the sentence "I bought all his books except the histories"—it is rendered by ménos, *less*, *minus*.

The conjunction *whether* is to be rendered in Spanish by *si* or *que*, and sometimes by the subjunctive of the verb *ser ;* as—

I doubt whether (*that*) thou hast any oil,	*Dudo que tengas aceite,*
I asked him whether (*if*) his mother would come,	*Le pregunté si su madre vendria.*
Whether he may have grapes or not is nothing to me,	*Que tenga uvas ó no, nada me importa.*
Whether it rains or whether it does not rain,	*Que llueva o que no llueva.*
Whether or not we may be (*let us be or not*) worthy of such an honour,	*Seamos ó no dignos de tal honra.*

The conjunction *as* is rendered by *como* when used by way of comparison, by *así como* when followed by *so*, by *cuando* when it means *when*, and after *mismo* by *que ;* as—

John is as[*] strong as a lion,	*Juan es tan fuerte como un leon.*
As modesty attracts, so dissoluteness repels,	*Asi como la modestia atrae, asi huye la disolucion.*
He saw her as (*when*) he was going home,	*La vio cuando iba a casa.*
It is not the same to promise as to fulfil,	*No es lo mismo prometer que cumplir.*

The conjunction *neither*, followed by *nor*, is rendered in Spanish by *ni*, and *nor* also by the same word ; as—

Swear not, neither by heaven, nor by the earth, nor any other oath,	*No jureis, ni por el cielo, ni por la tierra, ni por otro juramento alguno.*

At the end of a sentence, *neither*, and also *either*, if preceded by a negative, are rendered by *tampoco ;* as—

She will not do it, nor he either (*or* neither),	*Ella no quiero hacerlo, ni él tampoco.*

The conjunction *either*, followed by *or*, is rendered in both cases by *ó ;* as—

Either he is a knave or he is a fool,	*Ó es picaro ó es tonto.*

The conjunction *both*, followed by *and*, is rendered by *así* or *tanto*, and the *and* by *como ;* as—

Both in time of peace and in time of war,	*Tanto en tiempo de paz, como en tiempo de guerra.*
Both John and James will be here,	*Así Juan como Diego estarán aquí.*

These examples might be rendered by *as well as ;* thus, "in time of peace as well as in time of war," "John as well as James will be here."

The conjunction *lest*, when it means *for fear that*, is rendered by *no sea que ;* when it means *in order that not*, by *para que no ;* and when it means simply *that not*, by *que no ;* as—

Thou wilt accompany him to his house directly, lest any accident may happen to him.	*Tú le acompañarás á su casa al instante, no sea que le suceda algun fracaso.*
Love not sleep, lest want may oppress thee,	*No ames el sueño, para que no te oprima la indigencia.*
We were careful lest you should awake.	*Cuidábamos de que no se despertase V.*

The conjunction *rather*, when used in the sense of *but*, is rendered by *ántes* or *ántes bien ;* as—

I do not owe him anything ; rather he owes me something,	*Yo no le debe nada, antes bien él me debe algo.*

THE INTERJECTION.

The position of the interjection in a sentence is determined by no fixed rules, but is allowed to vary, as in English, according as harmony and propriety may require.

The interjection ete, *lo*, *behold*, is used with the first objective case of the personal pronouns only, being joined to them and forming one word ; as—

¡ Eteme ! *behold me !*
¡ Etele ! *behold him !*
¡ Etela ! *behold her !*
¡ Etelos que vienen ! *lo they come !*

The interjection he, *see*, *behold*, is prefixed to the first objective case of personal pronouns, and precedes adverbs, such as aquí, *here*, allí, *there ;* as—

¡ Hele aquí ! *here he is !*
¡ Hela aquí ! *here she is !*
¡ Helos allí ! *there they are !*

More literally these exclamations might be rendered, "see him here !" "see her here !" "behold them there !"

When adjectives are employed as interjections, they are followed by the preposition *de*, if a noun or pronoun come after ; for example :—

¡ Desgraciado de mí !	*Unlucky me !* (*or unfortunate that I am !*)

The interjection *ay* is followed by *de* when used before a noun or pronoun ; as—

¡ Ay de mí !	*Alas for me !* (or *woe to me !*)

IDIOMATIC CONSTRUCTION.

In Spanish the words forming a sentence are usually arranged in the order in which they modify each other—first the subject, agent, or nominative, then the verb, then the object of the verb, and lastly the indirect object—to each being annexed the words specially modifying it. But the laws of construction not being so rigorous and invariable as in the English language, the subject frequently follows its verb, inversion not being confined to poetry or considered peculiar to the interrogative.

INVERSION.

Inversion is obligatory in the imperative ; as, venga V. con Dios, *go with God ;* venga V. acá,

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[*] The first *as* is here an adverb, qualifying the adjective *strong*.

come hither. But this inversion is permissible chiefly in the following instances:—(1) At the beginning of a negative sentence; as, no me gusta la gran variedad de manjares, *a great variety of food does not please me.* (2) In sentences beginning with an adverb; as, aunque está V. durmiendo, *you yet. asleep;* ya está muerto, *he is already dead.* (3) In the latter clause of a complex sentence; as, para ser pobre, es mucho lo que gasta, *for a poor man, he spends much.*

The article is omitted after a verb of motion, with the words *casa, misa, paseo,* and a few others; as, salgo de casa, *I come from home;* vamos á misa, *let us go to mass.*

Adjectives are generally placed after the substantive which they qualify; in some cases their meaning varies with their position; while the cardinal numbers, words expressing some inherent relation of the noun, and a few others generally precede it.

An active verb governs its object with a preposition, if the object is a rational being; as, amar al projimo, *to love one's neighbour;* aborrecer á alguno, *to hate someone.* As an exception to this rule, certain verbs admit no preposition; as, tienen buenos amigos, *they have good friends;* comparo los hombres, *I compare men.* In all other instances the verb governs its object directly.

When there is no inversion, the adverb succeeds the verb it modifies. When denying or affirming, the adverb follows the verb; in compound tenses it follows the participle, but never the auxiliary verb: as, el niño ha estudiado siempre su leccion, *the boy has always learned his task.*

Some deviations from strict grammatical arrangement are allowable in Spanish, as conducive to beauty or energy of expression, which, however, may be better acquired from practice and observation than from any rules that may be laid down.

ENGLISH LITERATURE.—XVII.

[Continued from p. 259.]

THE REVOLUTION AND THE AUGUSTAN PERIOD: PROSE WRITERS.

The central figure in the world of thought and of letters in the years which followed the Restoration was that of John Locke, who was born in 1632. He was educated first at Westminster School, and afterwards at Christchurch, Oxford. At Oxford he spent many years after he had taken his degree, devoting himself mainly to the study of natural science, and especially of medicine, in which he became very proficient. After the Restoration, Locke was frequently employed in the public service abroad and at home; and was involved in the political conflicts of the time, attaching himself to the cause, and following the fortunes of Lord Shaftesbury, the able and ambitious leader of the Protestant party. After the final fall of Shaftesbury, and the triumph and accession to the throne of his enemy, the Duke of York, Locke's position in England became unsafe, and he retired to Holland, where he remained as long as James II. occupied the throne. In 1688, immediately upon the change of government, Locke returned to England. He was soon appointed to an important and lucrative post in the public service, as a member of the Council of Trade, an office which he retained as long as his health allowed of his doing so. After leaving the public service, he passed the remaining years of his life in the country in learned retirement. He died in 1704.

Locke's "Letters on Toleration" constituted the most systematic and philosophical argument in favour of toleration which had as yet appeared. His "Treatise of Civil Government" is an attempt to determine the true basis on which civil government rests, and the limits within which it ought to be restricted. Very similar in spirit is the "Essay on Education," which shows much liberality of spirit and a strong desire to throw off the narrowness which distinguished the system of education prevailing then even more than it does in the present day. The "Essay on the Reasonableness of Christianity" is a calm and serious argument on the subject which its title expresses; and it gives a greater insight into Locke's religious views and feelings than any other of his works.

But the work which has secured for Locke his great and lasting reputation, and given him a place among the greatest thinkers, is the essay "Of the Conduct of the Understanding." A critical examination of this remarkable book would be out of place here.

In the domain of mathematics and experimental philosophy the genius of Sir Isaac Newton stood supreme at the same epoch; nor did he stand by any means alone in the cultivation of these branches of science.

Among theologians a high place must be assigned to Gilbert Burnet, Bishop of Salisbury. Burnet was the religious adviser of the Princess Mary in Holland, and came with her to England on the accession of herself and her husband to the throne; and was soon after raised to the episcopal bench. As a theologian he is best known by his "Exposition of the Thirty-nine Articles." But his most important contributions to literature are his two historical works—the "History of the Reformation" and "History of his own Times," both of them works of great value, though their historical importance is greater than their literary merit.

One of the most eminent and probably the ablest theologian of the school which became predominant at the Revolution was Isaac Barrow, though he himself died too soon to witness that great event. Barrow was born in London in 1630, his father being a linen-draper in that city. He received his earlier education at the Charterhouse, and afterwards was entered first at Peterhouse and subsequently at Trinity College, Cambridge. Cambridge was thenceforth his home for many years, during which time his fame as a profound scholar and linguist, as well as a man of great scientific genius, especially in the department of mathematics, became widely known. He filled the post of professor of mathematics, and as such was the teacher of the great Newton, who succeeded him in his professorship. He was subsequently chosen as Master of Trinity College. His sermons will always rank with the writings of Hooker and Jeremy Taylor, the great classics of the English Church. Barrow died, at a comparatively early age, in 1677.

Archbishop Tillotson enjoyed during his life a fame and estimation as a preacher surpassed by few, and was among the most influential churchmen of his day; nor has the popularity of his writings altogether passed away. He was a man of great liberality and tolerance, and was raised to the archbishopric of Canterbury by William III

Of a very different school was Robert South. He was the son of a London merchant, and was born near London in 1633. Having received the rudiments of learning at Westminster School, he went to Oxford, and maintained his connection with that university for many years. He adopted the views of the courtly and anti-popular party, and took an active part in the conflicts of the time. After the Restoration he became chaplain to Lord Chancellor Clarendon, and, partly through his influence, received several successive preferments in the church from the Government of Charles II. The latter years of South's life were spent in retirement, and he died in 1716. His fame as a preacher was very great, and his sermons may still be read with great pleasure for the force and beauty of his style.

The most eminent in literature of the churchmen of the next generation was Bishop Berkeley, a man equally distinguished for his genius in science and philosophy, and for the purity and nobility of his life and character. It was not without reason that Pope attributed—

> "To Berkeley every virtue under heaven."

George Berkeley was born in Ireland, in the county of Kilkenny, in 1684. He was educated at Trinity College, Dublin, of which college he in due time became a Fellow. He then commenced those philosophical writings which have secured his lasting fame; and upon his removing to London a few years later, he was eagerly welcomed by all those most eminent in the world of literature and thought. The lofty earnestness of his character impressed the most frivolous, while its beauty and gentleness conciliated the most hostile. But Berkeley was not one of those who sought to use their popularity to secure any personal advantage. Having been promoted to the deanery of Derry, a lucrative as well as dignified post, he resigned this office with all its advantages, and abandoned that position in society which he was so well qualified to adorn, in obedience to the guidance of conscience, and went out to the West Indies, to place himself at the head of a sort of missionary college, intended to facilitate the Christianisation of the natives of North America. But the miserable pittance which had been promised to Berkeley for the maintenance of his college and the support of himself by the Home Government not being paid him, the enterprise failed, and he was forced to return home. He afterwards became Bishop of Cloyne, in Ireland. He died in 1753. Although it would be a grave omission in these sketches of literature if we were to omit so great a writer as Berkeley, it would not less be a departure from our plan if we were to attempt any analysis of his philosophical system, or any criticism of his writings.

Few careers have been more extraordinary in their vicissitudes than that of Henry St. John, Lord Bolingbroke. Born in 1678, the son of a baronet of ancient family and competent fortune, though he early gave proof of the possession of brilliant ability, he was in youth little distinguished except for his extravagance and dissipation. But having entered Parliament and devoted his great energies to politics, he was soon without a rival in eloquence and all the brilliant qualities which contribute to parliamentary success. He was a leader in that remarkable literary circle of which Pope and Swift were members. He had early allied himself with Harley, afterwards Earl of Oxford, and they soon became the leaders of the extreme Tory party. In the administration of Oxford, St. John, who had been raised to the peerage as Lord Bolingbroke, held the office of Secretary of State, and as such bore the chief share in bringing about the peace of Utrecht. On the death of Queen Anne and the accession of George I., Bolingbroke was disgraced and impeached, and fled from the storm. That he had been guilty of maintaining a treasonable correspondence with the exiled Stuart family there can be little doubt, and the unpopularity of the peace which he had been instrumental in bringing about exposed him to the indignation of the country.

He was condemned in his absence, and passed many years abroad, for some time being actually in the employment of the Pretender, though he soon quarrelled with him, and was ever after loud in his condemnation of Jacobites. After some years his attainder was reversed, and he was enabled to return to England. He strove hard to regain the political influence which he had once enjoyed, but in vain; and the closing years of his life were spent in retirement. He died in 1751.

Bolingbroke's works were numerous. Many of them were addressed to merely passing questions, and are now of little interest. A very large proportion consists of attacks more or less direct upon Sir Robert Walpole, Bolingbroke's great rival and enemy. Others again, and these were published after the death of the author, are attacks upon religion; for in matters of religion Bolingbroke was an avowed unbeliever. The most permanently interesting of his works are those which deal with historical questions and political principles, such as his "Letters on the Study and Use of History," and his "Idea of a Patriot King."

ADDISON AND THE ESSAYISTS.

Joseph Addison, the son of the Rev. Launcelot Addison, rector of Milston, Wilts, was born in 1672. He received his earlier education at the Charterhouse, from which he removed in due course to Magdalen College, Oxford. Before his university career had finished, Addison had acquired a reputation extending beyond the limits of the university, as a most finished scholar and a young man of rare promise. He was early taken under the patronage of the great Lord Chancellor Somers, and thus obtained the means necessary to enable him to travel for several years upon the Continent. On the death of William III., and the accession of Queen Anne, Addison's friends ceased to be powerful, and for some time he felt the change severely; but in 1704 he was applied to by Godolphin, on behalf of the Whig Ministry then in office, to write a poem in honour of Marlborough's great campaign in Germany, which had culminated in the victory of Blenheim. This was Addison's first really important literary venture. The moment was very favourable; the party in opposition were making persistent efforts to depreciate Marlborough's achievements; the Ministry were very anxious to meet these efforts quickly, and secure popular opinion on their own side; and they attached great importance to the projected poem. Addison's work was a complete success. To a modern reader it is almost intolerably stilted and unnatural, and in truth deserves what was said of it not long afterwards, that it was a "gazette in rhyme." But it suited the somewhat stiff and formal taste of the day. Indeed, the connections which it contributed to establish were the foundation of most of Addison's subsequent advancement. Addison's advancement in the public service was steady and rapid. He became first Secretary for Ireland. In 1716 he was married to the Dowager Countess of Warwick, a union which does not seem to have conduced to his domestic happiness, however it may have assisted his rise in the public service. In 1717 he was advanced to the dignified and responsible post of Secretary of State. But Addison's diffidence, and even awkwardness of manner, making him a very inefficient speaker in Parliament, disqualified him in many respects for this office; and there can be little doubt that a consciousness of his defects must have combined with his declining health in inducing him to relinquish office and retire upon a pension, after a short period of service. He died soon afterwards, in 1719.

Amongst Addison's poetical works, we have already mentioned the one which was at the time the most successful, "The Campaign." He was, besides, the author of many short occasional pieces of inferior interest. The words written by him for the opera of *Rosamond* are of much the same character as other pieces of the same kind, and would scarcely have been remembered now had anyone of less reputation than Addison been the author.

In the more formal drama, Addison's two attempts are the comedy of *The Drummer*—a slight piece, displaying much of Addison's humour, but scarcely to be called a success as a play—and the far more ambitious tragedy of *Cato*. Few plays have excited more attention, or have been, in one sense, more successful than this celebrated tragedy. But the play has really little to recommend it. Dramatic action or interest it has none; development of character it scarcely attempts; it is a tissue of pompous declamation rather than a play.

It is as a prose writer, and not as a poet, that Addison has earned immortality. His longer treatises—his "Travels in Italy," and his "Essay on Medals," of which the object was to show the importance of ancient medals, as throwing light upon ancient history—give evidence upon every page of Addison's delicate taste, finished scholarship, and minute acquaintance with ancient literature; and their style is beautifully clear and simple. But these works are at the present time almost forgotten. Those by which Addison is now known are his numerous short essays contributed to the three successive series published under the titles of the *Tatler*, the *Spectator*, and the *Guardian*.

The *Tatler* was projected and started in 1709 by Sir Richard Steele, Addison's colleague in many a literary work. It was published three times a week in the form of a small sheet. Its success was very great, though its fame has been eclipsed by that of its more celebrated successor. The *Tatler* lasted for nearly two years, and was then discontinued. In 1711 Addison and Steele together started the *Spectator*. This was a bolder speculation than the former, being issued every day. It was continued till the close of the following year. Its success was immediate and unbounded. The *Tatler* had been commenced not less as a vehicle for news—a record of all that could interest the town from day to day—than for the purpose of serious criticism and discussion. The *Spectator*, on the other hand, was from first to last the same in character. The daily sheet contained always an essay on some subject literary or social, a satire on some popular vice or folly, a story, a fable, sometimes even a religious meditation. The whole is connected together by the slight framework of a group of ideal characters, whose impressions and opinions are brought before us in successive numbers. The imaginary Spectator himself, who provides us with this fare, is a man who has seen much of the world, who, now living in London, takes his part in all its pleasures and pursuits, but who through all remains a silent observer. He is at home and at ease only in the society of the club, formed by a small circle of intimate friends. Among these friends the most notable is Sir Roger de Coverley, a beautiful picture of an old-fashioned country gentleman. The Spectator himself, with his bashful silence, his close observation of men and things, and his quiet humour, has been thought to be a portrait of Addison himself drawn by his own hand.

ELEMENTARY POLITICS.—IV.

[*Continued from p.* 247.]

FORMS OF GOVERNMENT (*continued*).

Of Democracies, or Democratic Republics, there have been two great types in history—"the primary democracy" and "the representative democracy." The first is the democracy of the ancient Greek and Roman world, possible only in small simple States consisting of a single city with a few square miles of territory. In it the sovereign power was in the hands of an Assembly in which every citizen had a vote. There was a sort of Executive Council, or Standing Committee, commonly called by historians a Senate, whose chief duties were to transact the minor business of the State, and to prepare motions and to put proposed laws into proper form. But the laws were voted, at least in principle, by the Assembly of the whole body of citizens; though sometimes their final form was settled by a special committee of "Lawgivers" (Nomothetae). And, while a good deal of the judicial business was delegated to judges, or to courts which were virtually committees of the Assembly, the principal cases were tried, and the most important steps in executive government taken, by the Assembly itself.

It is obvious that this form of democracy implies (1) that the citizens all live within easy reach of the capital; (2) that they have plenty of time to devote to politics. Both these requirements were fulfilled in ancient Greek States, which were very small; and very many of the citizens owned slaves, while many others lived in part on the revenue of the State, which was derived from its lands, or from the tribute of conquered countries, and paid to those who did political or judicial work, or sometimes distributed among the whole civic body. In modern times States are large, and most of the citizens have to work hard for a living. The only approach to the old "primary democracy" is in certain cantons of Switzerland, which are not sovereign States, because Switzerland is a Federation. Thus, in Uri and Unterwalden, every year the whole body of citizens meets, elects its executive officers, and passes new laws.

Modern democracies generally, therefore, are representative—that is to say, the function of legislation, and the general control of the executive and judicial authorities, are exercised by a Legislature composed of persons chosen by the inhabitants of the several electoral districts for a term of years.

It is generally understood that these persons, as the phrase goes, "are representatives and not delegates"—that is to say, that the electors give them a wide liberty of decision as to the way they are to vote. The text-book theory in the last century was that the electors, knowing the needs of their various neighbourhoods and the characters of their neighbours, sent up a trustworthy neighbour to act as their agent. But, except in the United States, candidates very often do not belong to the district they aspire to represent. And electors would be more than human if they trusted their agent so completely as not to give him some sort of direction as to the line they wish him to take; and of course this takes the form of asking him if he will support or oppose certain proposed legislation, and taking a pledge from him that he will do so. Modern democratic government—especially of the Parliamentary type—rests on the belief that the electors do not leave their representative complete freedom, but require him to pledge himself to support a certain line of policy. Were they not to do this, Parliamentary government would be utterly unstable. Nobody could predict what groups the members would form. Besides, the educational value of the suffrage would be lost. In two cases in France since 1870, the State was not far from a serious crisis because the electors voted (many of them) for the leading men in their district irrespective of their political programme. And a large number of these men happened to dislike the existing Constitution.

At the same time, a constituency ought to recollect that, except on questions which are vital to the existence of a political party, it is well to leave the members as free as possible. It is folly to lose a good man of real political ability because he will not support a proposal which only interests some one class. The danger is that by so doing, either a representative who disagrees more on the greater questions with the majority of the electors may be introduced; or that one may be selected who will give pledges freely just because on most of the questions he is asked he has no decided views at all.

The existing French Constitution provides for the independence of members by declaring that "any imperative mandate is null and void." That is to say, if the electors give their member a direction—either before or after his election—that he is to vote in a particular way, he must not pay any attention to it, but must vote as he thinks right.

In theory, of course, the member everywhere acts in all non-party matters as the member for the whole constituency. He presses on Parliament and the Ministry of the day the interests and views of his special electors, according as the district is agricultural, industrial, mining, or whatever it may be. But attempts have been made to get rid of the inconsistencies caused by the system of local representation, and to secure that the will of the people shall be really expressed in the acts of the Legislature. Members are now elected for very complicated reasons—personal character, or local influence, or sometimes less creditable reasons—as well as in order to vote for a certain policy. And in many cases personal and minor preferences dominate political. It is always a great step towards success to get a "strong local candidate," however keen the electors may be about political issues. For there always are some electors (and it is disgraceful there should be) who do not care about politics. And it is always possible that—especially on some matter which has not been much discussed—the majority of members may, after all, be found to think differently from the majority of the electors. Again, with constituencies of different sizes and elections fought on party lines, it is not absolutely impossible that most of the very large constituencies may vote one way and most of the smaller ones the other; so that if the smaller ones are much the more numerous, a majority of representatives may actually represent a minority of electors. Besides, the electors who vote for the unsuccessful candidate have no direct means of making their political will felt at all; they try to, and fail.

"Proportional" (or "minority") representation is a means of escaping from the latter difficulty, and an indirect means of securing that legislation shall really be in accordance with the popular will. The Referendum and Initiative are more direct means of securing the latter. Let us deal with them first.

The "Referendum" exists in Switzerland, both for Federal legislation and in most of the cantons. Any change in the Constitution, after it is adopted by both Houses of the Legislature, *must* be submitted to a vote of the whole body of electors. If a majority vote "Yes," it becomes law, but not otherwise. And any law passed by the two Houses must be submitted to a popular vote, provided a certain proportion of the members of the State (that is, in Federal politics, thirty thousand citizens or eight of the cantons, or States which together constitute the Federation) sign a formal demand, within a certain time of its passing, that it shall be so submitted. "Referendum" means "that which must be referred"—*i.e.*, to the vote of the whole body of electors.

Now nothing could seem fairer than this. Here is an opportunity to ascertain what the majority of the people really wish. In voting for a representative, some vote for him for one reason, some for another, most people for several reasons. Nobody can say exactly for what reason he is at last elected. Very likely some of the laws for which he votes have not been thought of at the time of his election. But in voting on a referred Bill, here is a distinct issue presented to the people: Do you agree to this or do you not?

Unfortunately, the results are rather disappointing. Last year (1891) a return was published of the number of times the Referendum had been used. It had not, of course, been actually used in more than about a fifth of the possible cases; but where it had been, the majority of the people had answered "No" rather more often than "Yes." Now, clearly this involves a good deal of waste of power. The Legislature spends a great deal of time in studying a question and doing its best to solve it. Presumably the Legislature is the agent of the people in this. Then the people come in and upset all the work of their own agent. And, unfortunately, the majority which upsets the work probably contains many more people who do not understand politics than the majority at an ordinary election. Such people very often will not vote at an election because the questions are complicated and there are many together, and they do not care to attempt to give them their attention. But every law proposed is capable of having objections of various kinds raised to it. And if you tell people who do not know anything about a proposal that there are certain advantages and certain objections, the probability is that the objections (if both sides are forcibly put) will carry the day in their minds over the advantages. And as there is only one question they do not mind attending to it. The first impulse of most people on being asked to commit themselves to anything that they do not understand much about, is very naturally to say "No." *

The "Initiative," which exists in some of the Swiss cantons, and is about to be introduced into the Swiss Federal Constitution, is as follows. Suppose a certain number of electors wish for legislation on a given subject—let us say, a law providing that everyone shall receive a pension after a certain age. They sign a formal demand and present it to the Legislature, which is thereupon bound to do its best to satisfy them. In some of the Swiss cantons a new Legislature must also be chosen to carry out the Referendum. Here, it will be seen, is a modified form of the "imperative mandate" deprecated by the French Constitution.

Minority representation would require far more elaborate treatment than is possible here. It must suffice to say that two forms of it have existed in England—the "three-cornered system" applied to certain large constituencies from 1865 to 1885, in which the constituency returns three members, but each elector can only vote for two candidates; and the "cumulative vote," familiar in School Board elections—while a still more elaborate scheme, invented by the late Mr. Hare, is called proportional representation. Under this scheme any elector can vote in the first instance for any candidate, whether in his own constituency or not. But if the plan stopped here the best-known candidates, such as Mr. Gladstone or Mr. Balfour, would be a very long way ahead of the rest, and many votes would be simply thrown away in swelling their majorities. So it is proposed that a certain number of votes—perhaps the whole number of registered electors divided by 670, the number of members of the House of Commons—should entitle a candidate to election. Any votes over this number should be transferred from that member to some other candidate if the elector had so directed. Thus a supporter of the Ministry of the day might show on his ballot-paper, which would be arranged for the purpose, that he wished to vote, for instance, (1) for the Prime Minister; (2) for the Chancellor of the Exchequer; (3) for some leader of the temperance party; (4) for some representative of labour; (5) for a manufacturer in his neighbourhood. If the first had his full number of votes, the elector's vote would be passed on to the second; if the second, on to the third; and so on.

The great objection to all these schemes is that they are very difficult to work. It is great waste of power to have a scheme the purpose of which the political party managers on each side will certainly do their very best to defeat. That has been the case with the first two; probably it would be the case with the third. There is another and more serious objection. Democratic government, as at present understood (especially the Parliamentary type of it), involves party government. That is, there are certain great definite issues before the country, and representatives take sides on them. But if the two latter schemes were applied to Parliamentary elections generally, there would probably not be two great parties in the Legislature: there would be a multitude of little groups, many of them returned not because of their views on the great issues, but because of their views on secondary issues. A House of Commons would contain, besides Liberals and Conservatives and Irish Home Rulers, a rather large group of members who were first of all members for the temperance party, another group whose first business it would be to oppose the temperance party in the interest of the liquor trade, a little group representing the opponents of vaccination, and perhaps a dozen or more other little groups mostly representing different trades and professions, who very likely would often be quite unpledged on all the great questions. Each side would make bids for the support of some of these groups by offering to fall in with their views to some extent. Nobody could say how long any Ministry would have a majority or what chance any Bill had of passing.

"A body," says Locke, "must move whither the greater force carries it, which force is the consent of the majority." Where is the "majority" under proportional representation, and why does it consent? And does it really represent the electorate?

THE CASE FOR DEMOCRACY.

Why should the attempt be made to express the popular will at all? It has been said that "the voice of the people is the voice of God." No statement can be more absurd. History shows us

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* An approach to the principle of the Referendum, it may be noted, exists in English local government. A free library supported by the rates cannot be established in any parish unless it is voted by the ratepayers. In the United States, laws passed by a State Legislature sometimes contain a clause providing that they shall not come into force unless approved of by a popular vote. Some have thought it would be well to append such a clause to a Home Rule Bill or to one disestablishing the Church of England.

hundreds of cases—the rise of Christianity is the most important—in which the party eventually acknowledged to be in the right has for a long time been only a small and persecuted minority. Great truths are first seen by such minorities, and it is their energy which converts the rest of the world. Why should not the decision on the most difficult and uncertain of all questions—those of politics and social science —be left to a select few of the wisest and best men, armed with force, if need be, to compel the unwise to obey them?

Or it may be said, again, as it was said by the great Greek thinker, Socrates:—"Politics is the only business which people think can be undertaken without apprenticeship. A shoemaker does not begin to make shoes until he has learnt something about his business. Yet anybody thinks he can give his opinion on the affairs of State, and many people seem to think they are quite competent to conduct them as well as the Government."

This last way of putting the objection to popular government overlooks the fact that the actual work of administration in a modern State is really carried on by skilled and trained persons. The voters know very little; the politicians who make speeches and become their representatives necessarily pick up some knowledge: it is the ablest, on the whole, of these politicians who conduct the Government—that is, decide broadly what measures shall be taken and what laws passed. But the actual work of carrying out their orders is in the hands of trained and skilled persons—the permanent Civil Service. And the "members of the Government," in all important questions, consult the heads of the departments of that service and consider their advice. A new Postmaster-General, for instance, would usually be quite "at sea," had he not permanent officials to teach him the business of the Post Office. If he wants to introduce a reform—the Parcel Post, for instance—he sets these officials to work to estimate the cost and draw out a scheme. Then he considers their scheme and their opinions. In planning or deciding on a scheme, he is somewhat in the position of the capitalist-employer, or *entrepreneur*, of whom we spoke in the Political Economy lessons. To go back to the shoemaking illustration: the voters are the customers, the Executive Government is the firm that takes the order, and the Civil Service is the journeymen who carry it out. And the voters—who pay taxes—are entitled to say what sort of shoes they like and whether their shoes pinch or not.

In a Greek State—such as Athens in Socrates' time—there was practically no Civil Service. Every citizen was supposed to have a claim to hold some sort of office at some time or other; and—to give everybody a chance—the less important work was usually performed by committees, places in which were actually assigned by lot.

But still it may be asked, Why should the right of voting be so widely extended? Why should every adult male, or almost every one, have a vote? In some of the United States the Constitution says that "all men are equal." But this is obviously false, if it means they are all equally wise. It appears to have meant originally, "all men are capable of reasoning, and the differences in their abilities are due to differences of opportunity and information rather than of power." This was a theory of certain Greek philosophers, the Stoics, and is adopted by Cicero. But it does not seem to be true either. In some modern Constitutions the maxim seems to have been intended to mean, As the State is a combination of persons to protect their lives, liberty, and property, everybody ought to have an equal claim to this protection, and an equal power of enforcing it by his vote. But how if he is not wise enough to judge rightly? Would he not be better off if some wiser person judged for him?

Again, democracies have often been charged with fickleness. The larger they are, however, the less fickle they are. We can see by watching successive elections in an English constituency that comparatively only a small number of persons really change their minds between one election and the last. Indeed, one of the greatest of recent English writers on political theory — the late Sir Henry Maine—condemned democracy on the ground that, in fact, the mass of the people are indolent and apathetic. They can only (he said) be induced to take an interest in politics at all—first, by stirring up party passions; secondly, by offering them substantial benefits if they vote for certain people. Both parties, in fact, bid for their support.

Now, to some extent, this is true. It is not clear that a democracy can be worked without party passions: the ancient Roman Republic fell partly because the mass of the people got heartily tired of party warfare, and the advent of an emperor, who settled most of the questions they had been fighting about and governed them better than they had ever been governed before, left them nothing to discuss. Again, the enormous difficulty of democratic government is the sacrifice of time and labour it demands from the voters. To secure its efficiency, one must not merely vote for good men, but see that the men brought forward are good men —that is, go to the meetings of the local branch of one's party and see that competent officials are elected to manage its business. But very few voters can do that; and it is found that in the United States corrupt party leaders can easily "pack" these "primary" meetings with their followers, who will of course carry out their plans. Then, when even a bad candidate is put forward, party loyalty often causes many good people to vote for him. The city of Philadelphia and many other American cities have been misgoverned scandalously for years together, because a corrupt set of people "controlled the party machine" and the really worthy men who belonged to their party felt that the principles of the party were so important, that they could put up with bad local officials for their sake—though as these officials took good care to hide their misdeeds except from very careful eyes, their average supporters had not the slightest notion how very bad they were.

Still, we have to remember—First, the voters pay taxes. We may regard them as clubbing together to pay the expenses of the Government; only as some individuals would evade payment of a voluntary subscription, the Government settles how the expenses shall be met, and compels each member to pay his appointed share. Now, each member ought in fairness to be free to criticise the arrangement and the way his money is spent. He can only give force to his criticism by his vote. Otherwise it is mere idle words. There should be no taxation without representation.

Again, truth in a complicated subject like politics is best got by full and free discussion. But what is the use of a discussion which need have no practical effect? People who have votes are worth convincing. People who have not, probably have other more pressing things to do than to listen to discussions about measures with which they have no concern but to obey them. The wider the suffrage, the more discussion; the better, on the whole, are the newspapers; the more careful is the study of political proposals; the greater, too, is the number of busy minds at work finding solutions; the more likelihood there is that men will realise their duty to the State. And besides, how are the wisest and best to be selected? The mind of a "body politic" is not all concentrated, as the human mind may be said to be concentrated over the brain and nerves; it is spread through the population, and the wider the suffrage, the more political interest, and the more discussion the more likely it is to "come out." Moreover, what security have we that the wisest and best will remain wise and good when placed where they have great opportunities for enriching themselves and oppressing others, unless they are looked after by those others?

In short, the real value of democracy is its educational and moral value. Every voter may feel, if he chooses, that he has some part in controlling the destinies of a great nation, and in getting right done by the Government according to the best of his lights. And the fact is that the issues are not so very obscure in the end. As it is absolutely necessary to convince the voters, a great deal of the best intellect in the country is devoted to convincing them. This is good both for the individual voters and the country, because the truth is brought out and the issues simplified. It is not the most ignorant who rule. It is the ablest among the voters who are convinced, and who convince others by their arguments or their personal influence. If you give the most ignorant a chance of ruling you, it becomes absolutely necessary to remove their ignorance. And so we find that, in England, improved elementary education and increased freedom of the press have followed extension of the franchise.

After all, moreover, the voter is really concerned more with issues than with persons; and he can do his duty and help society best by voting according to his conscience, and—last not least—by taking as active an interest in the local affairs of his party as time or opportunity admits. In politics, the fatal error is indifference.

COMPOSITE STATES.—FEDERAL REPUBLICS—EMPIRES.

We have previously said a little about Federations: the one great Federation of antiquity, the Achæan League, and the three Federations which stand out most clearly in modern history—the Swiss Confederation, the United States, and the short-lived Confederate States of North America—all are Republics. The Dominion of Canada is a Federation, constituted, not by voluntary union of separate states, like the others, but by an Act of the British Parliament, and subject to the British Crown. We have now to consider two other composite states. One may be classed as a monarchical Federation, the other a very anomalous case which is perhaps in process of becoming a Federation: the German and Austrian Empires.

The word "Emperor" is derived from a Latin word meaning "Commander-in-chief." The rulers whom we call Roman Emperors derived the greater part of their power from the fact that they were commanders-in-chief of an army, most of it recruited from countries outside Italy, and therefore capable of being used, if necessary, against any rebellion there. But this side of the Roman Imperial rule was carefully kept out of sight under the earlier Roman Empire. The forms of the old Republican Constitution were most strictly observed; the Emperor in Rome was not even called Emperor, but "Chief Citizen": he was in theory a chief magistrate elected for life, and with power to nominate his successor; and it was only as the powers of the Senate, the Popular Assembly, and the City Communities died down and were forgotten, that the despotic and military side of his rule was allowed to appear, at any rate in Italy. Even then its military origin was explained away by rather fanciful legal theories. Later on, this Empire was first divided between several rulers who were responsible to the Emperor, and then separated into an Eastern and a Western Empire, whose capitals were respectively Constantinople and Rome. The Eastern Empire lasted on till the Turks took Constantinople in 1458; the Western Empire was overthrown in 476 A.D., though nominally the Eastern Emperor became supreme over it. These Empires together had taken up the whole of the civilised world; and with the growth of Christianity the theory grew up that men ought to be united into one body—ruled over in spiritual matters by the Pope, in secular matters by a single ruler like the old Roman Emperor—both these rulers holding their power directly from God. Now Charles the Great (or Charlemagne), King of the Franks, the greatest of the monarchies which had risen through the barbarian invasions of the old Roman Empire, had protected the Papal dominions against the Lombards, and Leo III. therefore determined to crown him Emperor (in A.D. 800), and so transfer the seat of government again from Constantinople to Rome. The Eastern Empire still lasted on, but Charles the Great was head of the "Holy Roman Empire," which claimed to extend and to exercise dominion over the whole of Western Europe, or rather over the heads of the various States into which it was divided. This dominion was never complete, and in practice eventually became confined to Germany. The German King came to be elected by various German sovereign princes, who therefore were called "Electors," and was also, when crowned at Rome, Emperor of the "Holy Roman Empire." Attempts were occasionally made by the Emperors to centralise the Government and extend their own powers. But—(1) these all failed; (2) the Imperial dignity at last became the special possession of the Habsburg family, who also ruled Austria, together with Hungary and various parts of Eastern Europe. Napoleon, in 1806, formally abolished the "Holy Roman Empire," making the then Emperor "Emperor of Austria." But, partly from imitation of the ancient Roman Emperors, partly to mark himself as the successor of Charles the Great, and partly, no doubt, because he intended that France should be the ruling State in Europe, he took the title of Emperor of the French in 1804. His empire, abolished in 1814, was finally crushed after Waterloo, and revived for nineteen years (1851-1870) by Napoleon III.

COMPARATIVE ANATOMY.—XIV.

[*Continued from p. 251.*]

VERTEBRATA (*continued*).

MAMMALIA (*continued*).

The Teeth.—For variety and beauty, the teeth excel every other part of the mammalian body. They are confined to the jaws, and arranged in an uninterrupted series. Each jaw is hollowed out into a number of pits, or alveoli, in which the teeth are lodged, connected to the bone through the intervention of a membrane called the periosteum, which lines the tooth socket. Each tooth is composed of dentine, or ivory (Fig. 41, III. and IV., 4, 4), which forms a greater part of its substance. The projecting part, or crown, is covered with a very hard material called enamel (Fig. 41, III. and IV., 1, 1); and the root with a material which is named cement (Fig. 41, III. and IV., 3, 3). The enamel, when examined under the microscope, appears like a number of six-sided prisms closely pressed against each other, and directed perpendicularly towards the surface of the tooth (Fig. 41, V.). The dentine is composed of delicate branching tubes, which run from the central cavity (Fig. 41, III. and IV., 4, 4) towards the surface of the tooth. In the whale the teeth are represented by large flexible plates in the upper jaw, called whalebone (Fig. 41, VI. and VII.). In man, and the higher apes, monkeys, etc., there are in each half of each jaw two front teeth chisel-shaped, named incisors, or cutting teeth (Fig. 41, II., 1); a more pointed one called the canine, or dog-tooth, for biting, holding, and tearing (Fig. 41, II., 2); two somewhat flattened at the top, with single fangs, called false, or pre-, molars (Fig. 41, II., 3); and three situated behind all the rest, the true molars or grinders (Fig. 41, II., 4). To express the number of teeth in a simple manner, the following kind of table is used by naturalists, and called a dental formula:—

$$i.\ \frac{2\cdot2}{2\cdot2};\quad c.\ \frac{1\cdot1}{1\cdot1};\quad p.m.\ \frac{2\cdot2}{2\cdot2};\quad m.\ \frac{3\cdot3}{3\cdot3}.$$

The incisor teeth are very small in the insectivora, strong and large in the herbivora and rodents. The canines are large in the carnivorous and some other animals. Fig. 41 (VIII., IX., X., and XI.) shows examples of the teeth in the carnivorous, insectivorous, herbivorous, and frugivorous animals. The narwhal has only two teeth. The elephant has six—viz., an entire molar on each side of both jaws, together with two tusks of the upper jaw. In rodents the teeth vary from 12 to 28. In ruminants, apes of the Old World, and commonly throughout the mammalia, there are 32, the typical number, however, being 44. The cachelot (spermaceti whale) has more than 60 (which are confined to the lower jaw); and the dolphin 100 to 200 or more.

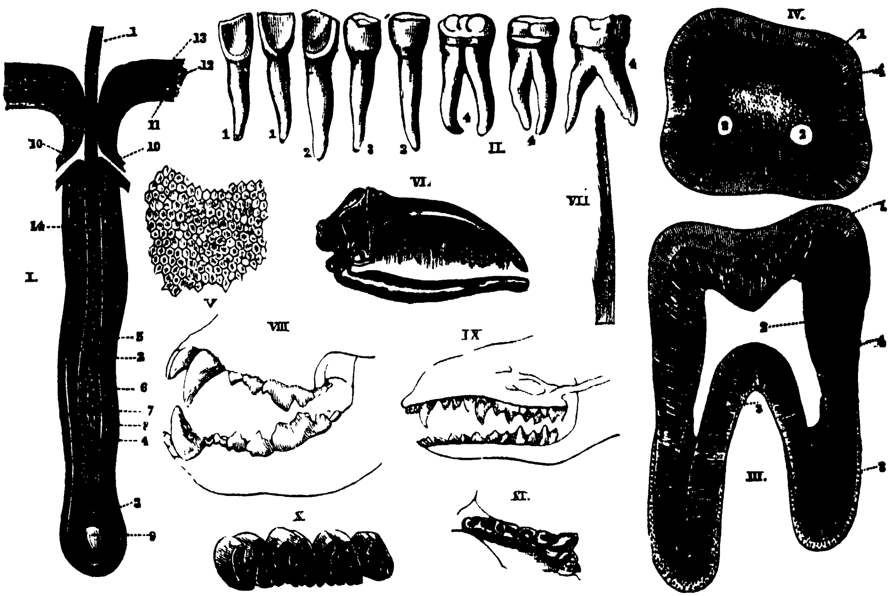

Fig. 41.—Mammalia.—I. Hair and Hair Follicle (magnified). II. Human Teeth. III. Vertical Section of a Human Molar Tooth. IV. Transverse Section of a Human Molar Tooth. V. Surface of the Enamel, with extremities of the Enamel Fibres (magnified largely, after Kolliker). VI. Osseous Head of the Greenland Whale, with the whalebone present. VII. The Whalebone. VIII. Teeth of a Carnivorous Animal. IX. Teeth of an Insectivorous Animal. X. Teeth of an Herbivorous Animal. XI. Teeth of a Frugivorous Animal.

Refs. to Nos. in Figs.—I. 1, shaft; 2, root; 3, bulb; 4, epidermis of the hair; 5, inner root sheath; 6, outer root sheath; 7, structureless membrane of the hair follicle; 8, transverse and longitudinal fibrous layers of the same; 9, papilla of the hair follicle; 10, excretory ducts of two sebaceous glands; 11, cutis; 12, mucous and, 13, horny layer of the epidermis—the latter entering a certain way into the follicle; 14, end of the inner root sheath. II. 1, incisive teeth; 2, canine or eye-tooth; 3, small or pre- molars; 4, large molar. III. and IV. 1, 1, enamel; 2, 2, pulp cavities; 3, 3, cement; 4, 4, dentine.

Animals are said to be monophyodonts that develop a single set of teeth, and diphyodonts that generate two sets of teeth. To the first belong the monotremata (ornithorynchus and echidna), edentata* (sloths, etc.), and cetacea (whales); to the second all the rest, except the marsupials, which the researches of Professor Flower have shown to belong to an intermediate type, shedding only one tooth (Fig. 42, XIV., 2, 2).

Alimentary Canal.— The mouth is separated from the upper part of the gullet by a pendulous musculo-membranous fold called the soft palate. This prevents the food, during the act of swallowing, from entering the back part of the nose. The upper part of the gullet is called the pharynx. It is a muscular bag common to both the food and air passages. The opening into the windpipe is protected by a movable leaf-like lid of cartilage, which effectually closes it during the passage of the food into the gullet. The food is propelled along the gullet by the successive action of the muscular fibres of which the tube is mainly composed. This act is beyond the control of the will. In many of the mammalia the stomach is a simple membranous bag, stretched transversely across the upper part of the abdominal cavity, and curved somewhat upon itself. The upper curve is smaller than the lower. The point where the food enters is called the œsophageal opening, and that where it leaves the stomach the pyloric (from the Greek, signifying a *gate-keeper*), because it is constricted by an aggregation of the muscular fibres of the stomach into a circular ring, which effectually guards the aperture until the food is sufficiently digested to permit of its passage into the intestine. In ruminants the stomach is much more complicated, being divided into a number of compartments (Fig. 41, XII. and XIII.). The first stomach is called the paunch (4), the second the king's hood, or honey-combed stomach (3), from being arranged in folds or cells similar to a honeycomb; the third, the manyplies (2), from its inner surface being increased by a number of longitudinal folds; the fourth, the rennet (5), named from its property of curdling milk. The ruminant swallows its herbaceous food partially masticated. It descends into the first stomach, or paunch, which corresponds to the crop of birds. When at leisure, the animal regurgitates the food to the mouth. A part is passed into the second stomach, and there formed into a smooth moistened mass, and then projected into the mouth, where it is now properly masticated, and again swallowed. This time the morsel passes into the third stomach, and, spreading over its longitudinal folds, is prepared for admission into the fourth or true digestive stomach, and thence into the small intestine. In the camel and dromedary the walls of the first and second stomachs are excavated into deep cells, wherein water may be retained in considerable quantities. On this account these animals are able to go many days without a fresh supply of water, even during long journeys across the hot sandy desert. The intestines (like those of man) consist of two portions, of which the first is named the small, and the second the large intestine. The point of separation between them is indicated by a valve formed by the mucous lining of the bowel, and in some animals by a cæcum, to which is attached a tail-like process termed the vermiform appendix. The relative length of the intestines varies. In the carnivora it is from five to fifteen times the length of the body; in insectivora, from three to six times; cheiroptera, two to seven; ungulata, fifteen to thirty; in the quadrumana, about three to eight times. The division into large and small intestine prevails with few exceptions throughout the mammalia. The membrane lining the small intestine is elevated into valvular folds, for the purpose of increasing the surface over which the digestive material has to pass; there are also embedded in it small glandular organs and villi. The former secrete a fluid which aids the digestive process, and the latter take into the system, as white blood, food already sufficiently prepared. The large intestine is sacculated. It commences by a blind extremity called the cæcum, at the termination of which the small intestines open. The cæcum is not always present, as in the insect-eaters, bats, edentata, and certain of the cetacea; and in other mammals it is variable in length. It is short in the carnivora, yet absent in bears and weasels. In the ruminants it is large and capacious. The appendix exists in man, apes, and gibbons, and also in the marsupial wombat, but in no other animal. In the monotremata (ornithorhynchus) the intestinal canal terminates in a cloaca, as in birds.

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* Edentata (*e* and *dens*), without teeth. In many of the species the teeth are entirely absent; in others only partially so.

The position of the heart is usually in the median line of the chest, lying between the lungs. In man and the higher apes it has an inclination towards the left side.

Nervous System.—As will be anticipated, the brain is found larger and more complicated in these animals than in the preceding classes. The convolutions of the brain are more numerous, and increase in complexity, as we ascend towards the higher mammalia, according with the increased intelligence which these animals manifest.

The Skeleton, in many respects, presents a close resemblance to that of man. It undergoes, however, many modifications. The skull and face are formed by a series of bones immovably bound together, and so arranged as to present several complete and incomplete cavities for the lodgment of the delicate organs concerned in the manifestation of the senses. Thus we have one cavity, of variable size, for the brain; another one for the nose; and one on each side of the face for the eyes. The mouth is situated at the base, in the interval between the upper and lower jaws. The size of the face becomes larger, and the cranium smaller, as we recede from man. The jaws are always articulated to the squamosal bone of the skull, without the intervention of a quadrate bone, as in the preceding classes.

Some of the mammalia (ruminants) have horns connected with the frontal bones. In deer the horns are called antlers, and are replaced annually. The horns of the rhinoceros are mere appendages of the skin. In the goat, ox, and sheep, the horns are hollow, and based upon an osseous process, which is hollowed out into cells. These communicate with certain cavities in the frontal bone, called sinuses. Such horns grow by layers, analogous to ordinary nail, and are never shed. With the exception of camels and musk deer, all the ruminants are provided with horns.

The vertebral column is made up of five segments. These are respectively named cervical, dorsal, lumbar, sacral, and caudal, according to their position. The cervical are in all but a very few cases seven in number (Fig. 42, XV., 12). The dorsal (13) vary from eleven to twenty, and give attachment to a corresponding number of ribs. Thus, in man there are twelve dorsal vertebræ, and as many ribs. The horse has eighteen, and the elephant twenty pairs of ribs. The sacral vertebræ are three or more, and are fused together, forming a wedge-shaped bone, called the sacrum (15). The tail (caudal) vertebræ (16) are represented in man by four small segments. In other mammals there may be as many as fifty. In certain rats they are entirely absent. The weight of the head is supported by a strong elastic ligament, vulgarly termed packwax, which extends between the back part of the skull and the neck vertebræ.

Every mammal is provided with four limbs, except the whale tribe, and these have only the two thoracic or anterior limbs. The limbs present many peculiar modifications, according to the habits and sphere of the animal. Thus, the thoracic limbs of the bat act as wings; those of the whale as oars; in quadrupeds, as legs; and in some, as the cat tribe, also as instruments of offence. In monkeys they are indiscriminately used as hands and feet; while in man the hand and arm are emblematical of his skill and prowess—by them he is enabled to accomplish the various duties which the exigencies of life entail upon him.

The bones of the extremities are: first, a broad and expanded bone, called the blade-bone (Fig. 42, XV.. 1) in the thoracic, and the innominate bone in the pelvic extremity. The blade-bone may or may not have a clavicle or collar-bone attached to it.

The arm and thigh bones are single, and called respectively the humerus (2) and femur (7). The fore-arm and leg have each two bones, viz., radius and ulna (3), and tibia and fibula (8). The bones of the hand and foot are very variable (5, 6, 10, 11). Man has five digits; the bat also five, but the thumb is small; while the other digits are very long and connected together by a fold of skin derived from the sides of the body, and continued along the whole length of the hind legs. The horse has only one perfect toe, and two imperfect ones; the end of the perfect toe is enclosed in a mass of horny matter, called a hoof. The toes of the carnivora are armed with claws; and many, as the well-known cat, have their feet padded with an elastic cushion, to enable them to tread noiselessly, and thus take their prey unawares. The ruminants have a cloven hoof, having two toes on each foot. Besides these there are a variety of modifications. Some animals walk on the sole of the foot, as man, bears, and badgers, and are called plantigrades. Others walk on the extremities of their toes, as the horse, and many of the carnivora; these are called digitigrades. The seal tribe, which have both fore and hind feet expanded into broad webbed paddles for swimming, has been called pinnigrade.

MAMMALIA—CLASSIFICATION.

A very generally adopted classification is that by Professor Huxley, founded upon the ingenious one of the celebrated French anatomist, De Blainville, who divided them into three primary groups, according to the characters of their reproductive organs, especially the reproductive organs of the female—viz., the Ornithodelphia, Didelphia, and the Monodelphia.

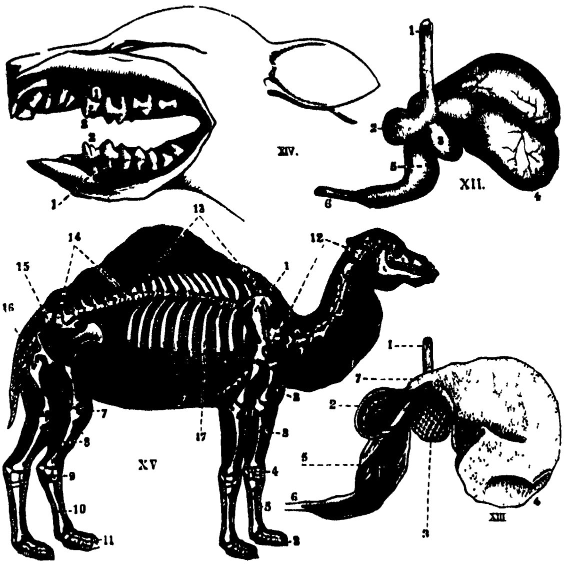

Fig. 42.—Mammalia.—XII. & XIII. Stomach, and Section of Stomach, of Sheep (after Milne-Edwards). XIV. Showing Dentition of a Marsupial (after Flower). XV. Skeleton of a Camel.

Refs. to Nos. in Figs.—XII. and XIII. 1, 1, gullet; 2, 2, third stomach; 3, 3, second stomach; 4, 4, paunch; 5, fourth stomach, 6, 6, pylorus and intestine; 7, œsophageal groove. XIV. 1, 1, permanent, and 2, 2, deciduous teeth. XV. 1, blade-bone or scapula; 2, humerus; 3, ulna or cubitus; 4, carpus; 5, metacarpus; 6, phalanges; 7, femur; 8, tibia; 9, tarsus; 10, metatarsus; 11, phalanges; 12, cervical vertebræ; 13, dorsal ditto; 14, lumbar ditto; 15, sacrum or sacral ditto; 16, caudal or ox-tail ditto; 17, ribs.

1. The *Ornithodelphia* (*ὄρνις, a bird; δελφύς, a womb*) comprises those two remarkable genera of mammals, the Ornithorhynchus and Echidna, which constitute the order Monotremata.*

2. The *Didelphia* (*δι, two; δελφύς, womb*) contains only a single order, the Marsupials.

3. The *Monodelphia* (*μόνος, single; δελφύς, womb*) comprises all the orders of Mammalia with a single uterus, or womb, in which the young are developed and nourished by means of a placenta, which, closely attached to the uterine walls, enables the maternal blood to pass to the offspring, and the waste products, which result from the rapidly developing tissues, to be removed away from it. They may be arranged thus:—

1. The *Primates*, containing two sub-orders. (*a*) *Anthropoidea*, man, apes, and monkeys. (*b*) *Lemuroidea*, or lemurs.

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* Μόνος, *single*; τρῆμα from τιτραίνω, *I pierce*; having only one opening for the urinary, genital, and intestinal canals.

2. *Cheiroptera.*—Bats.

3. *Insectivora.*—The so-called flying lemurs (galeopithecus); the hedgehogs, shrews, and moles belong to this order.

4. *Rodentia.*—Rats, hares, squirrels, etc.

5. *Carnivora.*—This order contains all the cats, hyænas, civets, dogs, bears, weasels, racoons, and seals.

6. *Ungulata.*—This order is divisible into two well-marked sub-orders, which pass into one another. (*a*) The Perissodactyla (horses, rhinoceroses, tapirs, palæotheria, machrauchenicæ), with the third digit of each foot symmetrical in itself, etc. (*b*) The Artiodactyla (hippopotamuses, pigs, anoplotheria, ruminants). With these may be placed the elephant and the hyrax.

7. *Cetacea.*—In this order the whalebone whales, the dolphins, and the extinct zeuglodonts, are comprised.

Two orders of monodelphous Mammalia remain—the Sirenia and the Edentata.

The existing Sirenia are the estuarine, or littoral, dugongs and manatees. The sloths, the extinct megatherium, and its allies the ant-eaters, the pangolins, and the armadilloes belong to the order of Edentata.

ENGLISH LITERATURE.—XVIII.

[*Continued from p.* 307.]

SWIFT.

JONATHAN SWIFT was of English descent; but his father having held an office in Dublin, the son was born in that city, a posthumous child, in 1667. His childhood was passed amid poverty, privation, and embarrassment. His education he received first at a grammar school at Kilkenny, and subsequently at Trinity College, Dublin. Here he not only failed to distinguish himself by his diligence or attainments, but seems to have left a very unfavourable impression of his abilities. Indeed, Swift's genius was very slow in showing itself: he was as remarkable an example of late mental development as his friend and fellow-worker, Pope, was of intellectual precocity. Swift was distantly connected by family with Sir William Temple; and not long after taking his degree he entered the service of that statesman, then living in luxurious and lettered ease at his country seat in Surrey. Swift's employment in Temple's service was an ambiguous one, something between secretary, literary assistant, and humble hanger-on; and it may easily be conceived how acutely painful such a position must have been to Swift's proud, sensitive, and not very generous nature. There was everything, in fact, in Swift's early life and training to embitter such a disposition as his. And the facts of his history go far to explain how one capable of the depth of tenderness and affection which Swift could show, could yet have entertained that hatred and contempt for mankind which render his satire not severe merely, but positively savage and ferocious.

It was while in Temple's service that Swift first met Esther Johnson—then a very young girl, passing as the daughter of Temple's steward, though probably, in reality, a natural daughter of the old man himself. She was the Stella whose name must always remain associated with Swift's, and whose sad story is one of the most touching in the whole history of literature. An attachment seems early to have sprung up between her and Swift: on her side it ripened into an absolute and life-long devotion; on his side there was, as his Journal to Stella shows, an affection, a tenderness of the rarest kind; though with that strange, unaccountable cruelty which was a part of his nature, he broke her heart through doubt, delay, and uncertainty, and married her only on her deathbed.

After the death of Sir William Temple, in 1699, it fell to the lot of Swift to collect and edit the works of his patron; and this appears to have been Swift's first public appearance in the paths of literature. He soon afterwards went to Ireland in the capacity, in the first instance, of chaplain to the then Lord Deputy, and was in time appointed to the living of Laracor in the county of Meath. This was now his home for some years; but his visits to London were frequent, where his great powers gradually became known, and his society proportionately cultivated among the wits and literary men of the metropolis.

His connection with Temple had naturally introduced him into political life as a Whig; but Swift's political principles were probably never very rigid, and before very long he took service under the Tory banner, and at once became the most powerful literary champion of the party of Harley and Bolingbroke.

It was during these constant visits to London that Swift's touching Journal to Stella was written, she remaining at that time near his home in Ireland. It was also during one of these visits that he became acquainted with the second victim of his affections, Esther Vanhomrigh, the daughter of a wealthy London merchant, who, under the poetical name of Vanessa given her by Swift, has become scarcely less famous than the unhappy Stella. Being left, by her father's death, with a competent independence, she also followed Swift to Ireland. Driven at last to desperation by doubt and jealousy, she sought to learn the truth about her rival, Stella (who was then, in truth, in her last illness, and whom Swift about the same time married), with a directness which excited his anger, and alienated him from her for ever. She died soon after, evidently under the influence of disappointed and wounded affection.

In 1713 Swift had been appointed to the Deanery of St. Patrick's Cathedral, Dublin; the character of his writings, and the personal enmity which his satire had in some instances excited, being an obstacle to that higher promotion to an English bishopric which he so ardently desired and so confidently expected. During his residence in Dublin as dean, Swift showed his great powers as a satirist and party-leader in their most conspicuous light, and became almost in a moment the idol of the Irish nation. It had been determined by the Government to introduce a large quantity of a new copper coinage into Ireland; and an English manufacturer, named Wood, had obtained the contract for the production of the new coin. Wood's halfpence were from the first regarded as a wrong and a fraud. But Swift took up the quarrel, and wrote his famous series of letters known as "Drapier's Letters," from their having been published under the signature of "M. B. Drapier" The skill with which these letters were framed was consummate, and their effect extraordinary. The people of Dublin, indeed of all Ireland, were excited to frenzy; the coinage had to be withdrawn; and though Swift was well known to be the author of the letters, the Government did not dare to attack him, and proceedings which had been commenced against the printer were discreetly abandoned. Thus did Swift "his wronged country's copper chains unbind."

But Swift's heart was never in Ireland. He was never an Irishman in real sympathy, and never loved to be thought one in any sense at all. London was the place to which his thoughts and wishes really turned; there he reigned supreme. He was courted by all the leading political men on both sides, and might have sold his services to either almost at his own price. In society his bitter and brilliant speech, and the dread of his powerful and somewhat unscrupulous pen, secured him that power which probably he valued more than affection. In the literary world he could have no rivals, except Pope and Addison. And Addison and Swift, though on opposite sides in politics, always treated one another at least with respect, a respect which Swift showed for few; and with Pope Swift lived on terms of close intimacy and genuine friendship.

Swift probably not only suffered throughout much of his life, but had even been conscious of a tendency to mental disorder; a tendency which may very probably be the true key to much of what is most strange and most painful in his very painful career. He had foretold in bitterness of spirit that he would "die at top first." And so it was. Disease of the brain began to show itself in him in about 1741; and for the last four years of his life he was reduced to a state of absolute idiotcy, in which he died in 1745. He was buried in St. Patrick's Cathedral. By a strange freak of feeling, showing alike what the end he anticipated was, and how oddly that anticipation worked upon his mind, he left the bulk of his fortune to found an asylum for the insane in the city of Dublin, which still exists there under the name of Swift's Hospital.

JONATHAN SWIFT.

To examine Swift's works with anything like the completeness which they deserve would demand far more space than we can possibly give to them in these lessons. His poems are numerous, chiefly mere *jeux d'esprit*—occasional verses on the most trivial subjects. It is impossible that such a man as Swift can write anything that shall not have merit of a certain kind; but these are rather the works of a wit than of a poet.

Upon political and party questions Swift was a most powerful and not very scrupulous pamphleteer; though it must be admitted, that after he had once chosen the Tory side he remained faithful to that party. The most important of his controversial writings of this class is the celebrated pamphlet on "The Conduct of the Allies," published in 1712, a work which contributed largely to the fall of the Whig party, the abandonment of the Whig policy, and the triumph of Harley and Bolingbroke.

Others, again, of Swift's works seem to be almost purposeless, to be written in the very wantonness of satire, merely because it was a pleasure to "laugh and shake in Rabelais' easy chair," because he loved to show us the world turned upside down, to startle us with paradox, to shock our sensibilities, to bring all that is most venerable into contact with the most centemptible associations. Of this class are his "Argument against Abolishing Christianity," his "Modest Proposal to the Public," and his "Directions to Servants."

But there are three in particular of Swift's works upon which his fame with posterity mainly rests: "The Battle of the Books," "The Tale of a Tub," both published in 1704; and "Gulliver's Travels," published in 1726.

The "Battle of the Books" is one of the many valuable pieces which we owe to the great discussion then at its height—of which the celebrated Boyle and Bentley controversy was an episode—as to the relative merits of the ancients and the moderns in the field of literature.

The "Tale of a Tub" is one of the most extraordinary satires ever written. Its object is to ridicule extremes in religion, and exalt what in Swift's view was the happy medium of the High Church Anglican party. But few can, we think, read the "Tale of a Tub" without feeling that from the audacious levity with which the whole subject is handled, the coarse ridicule which is thrown over everything, the effect of this great work is not less hostile to religion itself than to the follies or eccentricities of any particular sect.

The most popular, however, and deservedly so, of Swift's works is "The Travels of Gulliver." It is one of the most comprehensive of satires. Swift, though one of the most original of thinkers, never hesitated to borrow from his predecessors, to several of whom he is largely indebted. But his chief master in satire was Rabelais, from whom he has derived not only much of his manner and style, but even many of his minutest details. "Gulliver," however, is wider on the whole in its scope than the great romance of Rabelais; it is less a satire upon particular classes, and more a satire upon human nature. The form which Swift chooses for his satire is one which had been adopted by others before, and has been since—that of imaginary travels through strange regions.

POPE AND THE CONTEMPORARY POETS.

Alexander Pope was born in London in 1688. His father was a linendraper in the same city, but before his son was of an age to be influenced by the scenes around him, he had amassed a competent fortune, and, leaving London, settled in a country house in the neighbourhood of Windsor. The religion in which he was born—for his family were Roman Catholics—would alone have excluded Pope from the educational establishments at which most of his compeers in literature received their early training; and, in addition, the extreme delicacy of his health—for his frame was small and deformed, and his constitution weakly—prevented his being at any time sent from home for very long for the purpose of education. He was, however, carefully taught, especially by a priest in Hampshire, under whose care he was for some time.

Pope's poetical faculty showed itself at an unusually early age, even from his very childhood. "I lisped in numbers, for the numbers came," he himself tells. The ode on "Solitude" was written when its author was a boy of twelve; the "Pastorals" only two years later; and these were followed in rapid and unbroken succession by other works of greater or less importance. His poetical reputation was completely established by his "Essay on Criticism," published in 1711.

About this same period Pope began to be much in London, and to cultivate the society of the leading men of letters, frequenting for this purpose the coffee-houses at which the wits were wont to meet; and by the impression which his great powers thus made on those best able to estimate them, scarcely less than by his published works, he gradually attained the extraordinary and commanding position in the world of letters which he held until his death. His society was cultivated and his friendship sought by all who pretended to literary power themselves, or had judgment enough to appreciate it in another. Bolingbroke, the brilliant and versatile statesman and daring free-thinker, and Warburton, the learned and ingenious divine, were equally his friends. He was the chief and centre of a literary clique of which Swift, Atterbury, Gay, and a number of others whose names are scarcely less known, were among the members.

In 1717, his father's death having left him with a considerable inheritance, which, added to the profits of his own works, was amply sufficient to maintain him in ease and comfort, he removed to Twickenham, to the villa which his name rendered famous. Here he was able to indulge to the full his somewhat artificial tastes in gardening and decoration, and to enjoy at will the society of his many friends.

The diligence of Pope as a writer was very great; indeed, when we remember the extreme delicacy of his health (for his delicacy lasted all through life), it becomes amazing. The first part of "Windsor Forest," a descriptive poem in which Pope dwells with affectionate recollection upon the scenes amid which his childhood was passed, and the "Temple of Fame," a modernised imitation of Chaucer's "House of Fame," were undoubtedly very early works. So was, probably, the "Elegy to the Memory of an Unfortunate Lady." These productions were soon followed by the "Rape of the Lock," the second part of "Windsor Forest," and the beautiful "Epistle of Eloisa to Abelard." Immediately afterwards Pope undertook the great task of translating Homer into English verse, and at intervals from 1715 to 1720 the translation of the "Iliad" appeared. The "Odyssey," so much of it at least as is the work of Pope, very soon followed. His next important work was the "Dunciad," which in its first form appeared in 1728. For some years after this time Pope's poetical powers were devoted chiefly to a class of essays in verse, sometimes purely didactic, sometimes mainly satirical; the "Essay on Man" being of the former class, the "Moral Essays" of the latter. The last of his great poetical works, the "Dunciad," in its second and much altered form, appeared in 1742. Nor is this by any means a complete enumeration of Pope's poetical works. We have made no mention of a large number of short but by no means unimportant pieces; nor, with the exception of Homer, have we spoken of his numerous translations from the classical writers, or of his adaptations of the older English poets. And his poems are not his only works: he wrote much in prose, especially in the series of papers written by him in conjunction with Swift and Atterbury, and published under the name of Martinus Scriblerus. His correspondence was very voluminous, and has been published.

Pope died, in 1744, at the villa at Twickenham in which he had resided for so many years.

The first class of Pope's works which we shall consider, though by no means the earliest in point of time, are his moral or didactic poems; and of these the most important is the famous "Essay on Man." The "Essay on Man," comprised in four epistles addressed to Bolingbroke, was, as its author tells us, intended as an introduction to some pieces on "Life and Manners" which he intended to write, and of which the "Moral Essays" doubtless form a part. "I thought it more satisfactory to begin with considering man in the abstract, his nature and his state: since, to prove any moral duty, or enforce any moral precept, or to examine the perfection or imperfection of any creature whatsoever, it is necessary first to know what condition and relation it is placed in, and what is the proper end and purpose of its being." Accordingly, in the four epistles which make up the essay, Pope considers first "The nature and state of man with respect to the universe"; secondly, "The nature and state of man with respect to himself as an individual"; thirdly, "The nature and state of man with respect to society"; and fourthly, "The nature and state of man with respect to happiness." Under these various heads the poet seeks to expose and reprove the error of those who complain of the condition of man in the world, and find fault with the dealings of Providence, by pointing out that we see only a portion of those dealings, and are therefore not in a position to judge of them; and by the aid of such reflections as these he seeks to promote contentment and resignation, and lay the basis of a system of moral duty. It must be admitted, however, that as a philosophical treatise the "Essay on Man" is eminently unsatisfactory. It is neither original nor profound in thought; and it is very far from disposing of the difficulties and mysteries upon which it touches. But in language and style the essay is throughout perfect; and the admirable truth of its observations of human nature, and the marvellous beauty and eloquence of its illustrations of its qualities, render it a very great poem.

To the same class of writings in many respects as the "Essay on Man" belong those which we have next to consider—the "Moral Essays." But these are not, like the "Essay on Man," philosophical treatises attempting to solve the great enigmas of the universe. They deal with human nature in detail—the diversities and eccentricities of character. They contain the most brilliant and life-like pictures of individual character, and show Pope's powers of satire in their highest perfection. The first epistle is on the "Knowledge and Character of Men." In it, after speaking at length of the inconsistencies and seeming incomprehensibility of men's characters and conduct, he develops his favourite theory, that there is a key to be found to every character in the ruling passion; and he concludes with some most striking examples, both humorous and pathetic, of the "ruling passion strong in death." The second epistle, "On the Characters of Women," is equally brilliant. The third and fourth epistles, on the "Use of Riches," afford Pope an admirable opportunity for the use of his varied powers.

The most important work of pure satire which Pope produced is the "Dunciad," a sort of mock-heroic poem in which the glory and triumph of Dulness, the election of the King of the Dunces, and the solemnities on the occasion are related with the utmost seriousness, and with extreme humour, sometimes mixed with a good deal of coarseness both of idea and expression. The plan of the poem was, no doubt, in part suggested by Dryden's satire of "MacFlecknoe," though the two works have very little in common. The first book of the "Dunciad" opens with an excellent description of the Empire of Dulness, and then goes on to relate the election of a successor to the throne of Dulness, in place of Eusden, the City poet, lately deceased. In the first edition of the "Dunciad" Pope assigned the bad eminence to Theobald, a man who unquestionably merited the title of dull, and who had been one of the many antagonists of Pope, and his rival as an editor of Shakespeare. In the second version of the poem the whole drift of the satire is changed, and in place of Theobald we find as King of the Dunces Colley Cibber, a writer of plays very popular in their day, and who, with all his faults, certainly by no means deserved to be called dull.

ALEXANDER POPE.

In the second book, which is the most ingenious, the most humorous, and the most severe of the whole satire, the poet, in imitation of the games in which the ancient epic poets took so much pleasure, gives an inimitable description of the contests and trials of skill held in honour of the election of the monarch. In the third and fourth books we have an account of various scenes at the Court of Dulness; and a wonderful picture in mock-heroic strains of the gradual extinction of Sense, Wit, and Learning, and of the power of Dulness enveloping the whole world. This satire gave Pope an opportunity of doing two things—first, of entering his genuine protest against and thoroughly exposing the bad taste, useless learning, and misapplied ingenuity which he saw around; and, secondly, of taking a signal revenge upon all those in the world of letters from whose attacks, provoked or unprovoked, he had suffered. Not one of them escapes; not one of them but is exhibited in a light equally ludicrous and contemptible.

In its bright and sparkling humour, the most akin to the satires among Pope's poems is the delightful "Rape of the Lock"; indeed, in one sense, it might be called a satire The occasion of the piece was the adventure of a young nobleman who presumed furtively to cut a lock of hair from the head of a fair lady. The incident led to an estrangement between the two families, and Pope is said to have written his poem with the benevolent intention of bringing about a reconciliation, an object in which he succeeded

It has already been said that Pope, like all the poets of the same school, is, for one so great as he was, deficient in the power of depicting passion or moving our sympathies. The two most important poems, in which the interest is mainly founded upon the pathetic, are the "Elegy on the Death of an Unfortunate Lady," and the "Epistle of Eloisa to Abelard." The first of these is full of beauty and tenderness. But it discloses too little of the melancholy story to which it refers, and is too studied and regular to appeal very strongly to the feelings of the reader. The "Epistle of Eloisa to Abelard" is of far higher power.

The poets of Queen Anne's day, as they were deficient in power over the emotions, were no less wanting in genuine appreciation of external nature. They are at home only in the city, in the club, among men and women living in a highly artificial state of culture. And this characteristic is very apparent in Pope's country poems, such as the "Pastorals" and "Windsor Forest." No one can fail to admire them for the beauty of their diction and versification. Their ideas, too, are always appropriate. But they are unreal. They have nothing of the open air about them, none of the true breath of the green field and the wood.

There remains one great work of Pope which we cannot leave unnoticed—his translation of Homer. Of all the poet's works this was the one from which he derived incomparably the largest pecuniary profit; and it probably contributed more than any

other to establish his fame. Nor is this remarkable Pope translated the "Iliad" and one-half of the "Odyssey"; and his translation is undoubtedly a great poem. The actual sense of the original is throughout preserved with substantial accuracy; and the language and versification are faultless And in Pope's days, while men's taste in poetry was what it then was, no one looked for anything more; a version which reproduced the old Greek bard more faithfully would not have been admired or appreciated But, in truth, no great poet was ever so ill qualified to translate Homer as Pope, just as no generation of Englishmen were ever so ill qualified fairly to estimate a translation of Homer as the generation among whom Pope lived The finish, the antithetical neatness of Pope's diction, the even monotony of his verse, with its uniform rhyming couplets, are the very opposite of Homer's characteristics. The result is that, as was said by a contemporary critic, though the poem is a great poem, "it is not Homer." In tone, spirit, and character it is wholly unlike the original.

POPE'S VILLA, TWICKENHAM.

John Gay was one of the most eminent of the minor poets in the society which surrounded Pope and Swift. Witty, genial, kindly, and affectionate, he was not only popular with the public, but singularly beloved by his friends. He received more than one fortune, but always lost them; made much money by his works, but never kept it; was a favourite with the great, but never received any public advancement; and "died unpensioned with a hundred friends," having for many years lived as a kind of favoured pensioner in the household of the Duke and Duchess of Queensberry. His most important works are a series of pastorals published under the name of "The Shepherd's Week"; his Fables, "Trivia," a burlesque or satire upon London life, and, above all, the *Beggar's Opera.* This last was the most successful piece that had ever been acted It became the rage in a moment, is said to have for some time driven Italian opera from the stage, and is by no means forgotten yet. An accomplished critic has truly said of Gay that in his ballads "there is a peculiar, hinted, pathetic sweetness and melody It charms and melts you It is indefinable, but it exists; and is the property of John Gay's and Oliver Goldsmith's best verse, as fragrance is of a violet, or freshness of a rose"

A very different career was that of Matthew Prior He was of very humble origin, being the son of a vintner in Whitehall; and we find him in his after-days of prosperity and distinction often reproached with his ignoble birth. His first literary effort was "The Town and Country Mouse"—of which he wrote the greater part—a burlesque poem intended to ridicule Dryden's "Hind and the Panther." This brought him to the knowledge of influential men, and was the source of his advancement in life. He became secretary to the embassy at the Hague, and ultimately rose to the important post of British Ambassador in Paris for King William III. and Queen Anne. Prior's poems are for the most part short lyrical pieces on occasional subjects. They are little read now; but they are light, easy, and graceful, showing much knowledge of men and much humour, though not without the taint of coarseness.

There are very few poets whose reputation has so clearly illustrated the fluctuations in popular taste from age to age as that of Edward Young. He was born in 1681 and died in 1765, thus surviving for some years most of those of whom we have to speak in this lesson. And indeed, except in the artificial character of his poems, he has not very much in common with the school of Pope. Young was a clergyman, though he seems to have taken orders rather in disappointment at his want of success in other employments than from any great devotion to the sacred calling. In the Church, too, he seems ever to have indulged hopes of success and advancement which were never realised. He became a soured, disappointed, and discontented man, unhappy in himself, and not very amiable or attractive to those about him. His great work—the only one which is now much remembered—is the "Night Thoughts," a series of nine meditations on subjects whose solemn character is suited to the night, to which they are assigned. In these somewhat gloomy meditations we may well suppose that Young sought relief from his own vexation and bitterness.

There are but a few more among the poets of this age who ought not to pass wholly unnoticed, though we can do little more than mention their names. Thomas Parnell was another of Pope's literary friends and followers. He was an Irishman by birth and education, and held a living in that country. The work by which he is best known is his poetical tale of "The Hermit." Sir Samuel Garth was a physician of eminence. He is known by his poem, "The Dispensary," a fairly successful example of that easiest of all forms of literature, the burlesque. Sir Richard Blackmore was likewise a physician in extensive practice. His works are enormously voluminous; epic after epic flowed from his pen, few of which were read at the time, and none of them now. He is remembered chiefly by Pope's satiric attacks upon him in the "Dunciad." The same may be said of Ambrose Philips, a writer of pastorals and other shorter pieces. His reputation was great during his life. His very name would probably hardly be remembered now, had not Pope given him immortality.

LOGIC.—V.

[*Continued from p.* 281.]

FALLACIES (*continued*).

We now come to the consideration of *material* or *non-logical* fallacies, as they are sometimes called.

The first of these is termed *Ignoratio Elenchi*, because in it, instead of proving the contradictory of the proposition advanced by your opponent (which, in order to refute him successfully, you are bound to do, and which Aristotle calls *Elenchus*), you prove some other proposition which, by more or less resembling it, is likely to be mistaken for it. In doing this, some one or more of the rules given by Logic for proving the contradictory of a given proposition will be violated.

This is a fallacy which is very common in argument or controversy; and the particular manner in which the conclusion is irrelevant—*i.e.*, fails to answer the purpose it is supposed to answer—varies with each particular case. Sometimes a particular will be proved when a universal is required; sometimes one with terms which are not the same in sense as those in the conclusion really given to be established. Suppose we are seeking to prove that a certain man was virtuous in his life and character (which makes it necessary to show that on the whole *all* his acts and deeds were virtuous), but we claim to have proved all that is required, when we show satisfactorily that *some* of his acts were of this character, leaving out of sight altogether many others of a very different aspect. This is an instance of *Ignoratio Elenchi*. So also if, when we ought to show a thing is just, instead of that we show that it is inexpedient, or *vice versâ;* or, if the right of private judgment in matters of religion be maintained, we imagine this disproved by the statement, however true, that it is impossible for everyone to be right in his judgment, which in reality was never denied by our opponent. An instance of the employment of this fallacy through the instrumentality of an ambiguous term is often afforded by those who, in theological controversy, establish certain conclusions in reference to "faith," used in one sense, and then use these conclusions to meet arguments in which the word is used in a different sense.

This is really the fallacy involved in the error of shifting ground, as well as in that of combating *both* the premises of an opponent *alternately,* instead of dealing with one only at a time, and having done with it before proceeding to another.

Persons often seem to think that it is quite sufficient to show that there exist grave objections against the adoption of a particular plan in order to force others to reject it. This is in reality the fallacy of *Ignoratio Elenchi;* it is proving that there are weighty objections against a particular course, when what is required to be proved is that there are *more* weighty and insuperable objections against its adoption than against its rejection.

It should be borne in mind that those who employ this fallacy very frequently suppress the conclusion they are really proving, in order that it may thus escape notice that they are not really proving the one required; and, as Archbishop Whately remarks, this is, "perhaps, the most common form of that confusion of thought to which those are liable who have been irregularly and unskilfully educated—who have collected perhaps a considerable amount of knowledge, without arrangement, and without cultivation of logical habits. Most of the erroneous views in morals, and in other subjects, which prevail among such persons, may be exhibited in the form of fallacies of irrelevant conclusion: *e.g.*, the question 'whether it be allowable for a Christian to fight in defending himself from oppression and outrage,' and, 'whether a Christian magistrate may employ physical coercion, and inflict secular punishment on evil-doers,'—these are perpetually confounded with the questions 'whether Christians are allowed to fight *as such—i.e.*, to fight for their religion against those who corrupt or reject the faith'; and 'whether a Christian magistrate may employ coercion on behalf of Christianity, and inflict punishment on heretics as evil-doers.'"

The fallacy called *Petitio Principii* (begging the question) is used whenever that is assumed as granted which ought to have been proved. This is the account ordinarily given, although Archbishop Whately confines the name to those cases in which one of the premises is plainly the same as the conclusion, or is proved from it, or is such as the person to whom the argument is addressed would not know or admit, except as an argument from the conclusion: *e.g.*, where one argues in favour of the authenticity of a history from its recording certain facts which rest themselves for their reality merely on the evidence of the same history.

The form in which this fallacy most commonly occurs is in that which has been called "arguing in a circle"—a species of argument in which the ultimate conclusion is proved by a train of reasoning, which has one of its premises the same as this conclusion: *e.g.*, "Some mathematicians," according to Whately, "attempt to prove that every particle of matter gravitates equally. 'Why?' 'Because those bodies which contain more particles ever gravitate more strongly, *i.e.*, are heavier.' 'But (it may be urged) those which are heaviest are not always most bulky.' 'No, but still they contain more particles, though more closely condensed.' 'How do you know that?' 'Because they are heavier.' 'How does that prove it?' 'Because all particles of matter gravitating equally, that mass which is specifically the heavier must needs have the more of them in the same space.'"

It should be observed that the longer the chain of reasoning—*i.e.*, the wider the circle—the more likely it is that the fallacy will escape observation.

The fallacy of "*non causa pro causâ*" (literally, "taking as the cause that which is not such") is divided into two kinds, called respectively "*a non verâ pro verâ*" and "*a non tali pro tali*," which in reality are—the former, arguing from a false premise as if it were true (*i.e.*, having, in logical language, the *expressed* premise false), and the latter arguing from a case not parallel or similar, as if it were (*i.e.*, having the *suppressed* premise false). In the one case there is *no* connection at all between the effect and the cause to which it is attributed; in the other, if there is any such connection at all, it is an *insufficient* one.

Instances of the fallacy of "*non causa pro causâ*" are very common, especially among the uneducated and vulgar, who are very liable to suppose, from seeing two events often or even sometimes conjoined, that there subsists some necessary connection between them, that the one must be the cause of the other. Most instances of popular superstition may, accordingly, be referred to this source. In this way it used to be generally thought that the appearance of a comet portended some great national calamity, merely because it so happened that on several occasions when comets were visible great disasters occurred in some portion of the world. Not that this erroneous mode of reasoning is one from which the educated and scientific can be supposed free. Most writers upon political economy in the last century (until Adam Smith) thought that money, in place of being merely a sign, was the cause of wealth in a country, and hence tried to restrict its flowing out in the natural course of trade; and no error is more common in politics than to attribute the state of trade to the political character of the Ministry without making any attempt to show the connection. An instance not uncommonly given of "*a non tali pro tali*" is this: "What intoxicates should be forbidden; wine intoxicates; therefore wine should be forbidden": here the minor premise only being true of wine taken *in excess*, is in the conclusion treated as if it were true of wine taken in any quantity. This might also be exhibited as a fallacy "*a dicto secundum quid ad dictum simpliciter*."

We have thus given a brief and incomplete outline of the kinds of fallacies most usually met with in argument with others, or most liable to deceive us in solitary reasoning; and we shall now illustrate the remarks made by some examples of the most celebrated fallacies on which the ancient logicians used to exercise their ingenuity.

Perhaps the most celebrated of all is that of "Achilles and the Tortoise." It runs thus:—"Suppose Achilles to run ten times faster than the tortoise; and while he remains in his place let the tortoise start and run through a certain portion (say a tenth) of the entire space to be traversed. Let Achilles then start to overtake the tortoise; he can never overtake it; for, while he runs through the tenth part of the course by which the tortoise had the start of him, the tortoise will have run further through a tenth of a space equivalent to that—*i.e.*, through $\frac{1}{100}$th part of the whole—and when Achilles has got through *this*, the tortoise will have got on in advance through $\frac{1}{10}$th part of this, *i.e.*, through $\frac{1}{1000}$th part of the whole, and so on for ever; so that Achilles will never be able to overtake the tortoise, though he runs ten times as fast." The solution of this fallacy by Diogenes (*Solvitur ambulando*)—*i.e.*, that it is false—is hardly a satisfactory logical mode of escaping from the difficulty. No one ever doubted *that*. Nor is it much more satisfactory to allow, as Archbishop Whately does, that it cannot possibly be exhibited in a syllogistic form at all, which would virtually be a surrender of the proposition that the syllogism is a test by which we can always distinguish between sound and unsound reasoning. Mansel's is the best solution, which classes the fallacy as a *material* one. Let the whole space to be traversed be represented by A, and then the syllogism representing the reasoning will be this: "Any space equal to $\frac{A}{10} + \frac{A}{100} + \frac{A}{1000}$, etc., is infinite (being the sum of an infinite series). The space to be passed before Achilles overtakes the tortoise is equal to that sum; therefore it is infinite." In this the major premise is simply *false*. The sum of an infinite series is not necessarily infinite; it may be, and in this case is, finite. And this solves the whole mystery.

There was a rather celebrated fallacy which seemingly proved that motion was impossible: "Whatever body moves must move either in the place where it is, or in the place where it is not; neither of these is possible; therefore, a body cannot move at all." The true solution of this sophism, as pointed out by Hobbes and Dean Mansel, is, that the major premise is false. It is not true that a body must move either in the place where it is or in the place where it is not; for it may, as it does, move partly in the one and partly in the other; and the fallacy thus lies, not in the form, but in the matter.

One more example of these ingenious puzzles may be given: "He who is most hungry eats most; he who eats least is most hungry; therefore he who eats least eats most." The true solution of this manifestly is that there are in the supposed syllogism more than three terms, inasmuch as what is really meant is, "He who is most hungry *will eat* most; he who *has eaten* least is most hungry; therefore, he who *has eaten* least *will eat* most."

It would not, however, be suitable to dwell longer upon such fallacies as these, which were usually looked on rather as amusing exercises for the ingenious than as leading to any useful result.

It should always be borne in mind that the ambiguity of words is, perhaps, the most fruitful source of undetected fallacy in reasoning, whether it be solitary or in controversy with others. Words are constantly made use of in senses which, though apparently identical, are really different, and are thus made the means of arriving at conclusions wholly erroneous. A list of words of this kind, with illustrations of their employment, may be seen in the appendix to Archbishop Whately's "Treatise on Logic"; and such a list might easily be largely extended, and illustrated by numerous examples from polemical discussions. It will therefore be useful to mention a few of the instances which he gives of words whose different senses are likely to be confounded.

"Impossibility" (with its kindred words) is used with three different and distinct meanings. 1. It is employed to denote *mathematical* impossibility. Anything is so called which involves an absurdity or a contradiction, this name being given from the fact that the greater number of instances of it occur in the mathematical sciences: *e.g.*, that two straight lines should enclose a space is a mathematical impossibility. It is absurd, inconceivable, and a contradiction in terms, being at variance with the very definition of a straight line. It amounts, in fact, to this, that the same line should be straight and not straight at the same time. 2. A *physical* impossibility is something at variance with the existing laws of nature, and which cannot take place while those laws remain as they are: *e.g.*, that a man should be able to live under water, or that a feather and a stone should fall to the ground in the same space of time. There is not here, as in a mathematical impossibility, any *inconceivability* implied. We can quite readily conceive the existing laws of nature altered so that a man should have the power of living under water, and a feather and a stone have the same weight (*i.e.*, be attracted with equal power towards the earth). There is no contradiction involved in imagining this to be so; and we, in fact, know that, whenever a *miracle* has been performed, such a suspension or violation of the laws of nature *has been* brought about by the power of the Supreme Being. *We* cannot, however, surmount these laws, and so they impose restrictions upon us which it is a physical impossibility for us to overcome. Persons have been often led into error in reasoning through not keeping these two senses of the word distinct. 3. The word "impossibility" is used to denote that strong degree of certainty which leaves no room for doubt upon the mind. We may be convinced that a certain event will never occur, even though it does not involve either a contradiction or a violation of any of the known laws of nature. Such an event is termed a *moral* impossibility. A good instance occurs in throwing dice. It is a moral impossibility that we should throw sixes a hundred times successively. We are certain, from our experience and reason, that such a contingency will not occur, although its occurrence is undoubtedly neither a mathematical nor a physical impossibility. So also it would be said to be morally impossible for all the inhabitants of England to be perfectly free from the commission of crime, although it is within the *power* of every individual inhabitant to refrain from any criminal act. We know, however, that while the world remains as it is, such a state of things will never happen.

The words *may* and *must* have also two senses, which are not unfrequently confounded with one another. They sometimes refer to *power*. Thus, when I say, "I *may* leave this room," I mean that I have the power to do so when I please; or "a prisoner *must* remain in his cell," that the physical restraint he is under deprives him of the power of acting otherwise. But sometimes these words merely refer to possibility or *contingency*. "A particular individual *may* die to-morrow," merely implies the possibility of such an event as his death; or, "we *must* all die some day," merely expresses the *certainty* we feel that we are all mortal.

It frequently escapes notice that the word *same* is used in two senses. Its primary sense is, of course, that which denotes absolute identity. In that sense I say (for example) that the shilling now before me is the *same* that I got from a certain person in change yesterday—the two being numerically one. I use the word, however, in a very different sense when I say that two persons are afflicted with the *same* disease, or have hair of the *same* colour. In *this* case, all that I mean is that the two illnesses or the two kinds of hair are *similar*, that the very same description would apply to each. Archbishop Whately thinks that nothing has had such an effect in fostering Realism as the non-attention to this distinction between the primary and secondary use of "same" and kindred words. And it will not be out of place to give a brief account of what is involved in the famous controversy between the Nominalists and Realists which was waged so furiously in the Middle Ages.

The question which gave birth to so many different schools of thought might be treated in various ways. Perhaps the shortest statement that could be given of it is this—What is the object of our thoughts when we make use of general or universal terms? There is no difficulty, so long as we use a singular term, one which relates only to a single individual: *e.g.*, "Peter," "Julius Cæsar," "this tree," "this mountain." Here the object of which we are thinking, and which is present to our mind, can be nothing else than the one individual for which the name stands. When, however, we make use of the corresponding general or universal terms, "man," "conqueror," "tree," "mountain," the case is different. Here we cannot accurately specify the object of our thoughts with the same facility as before. We have no longer a term which is applicable to one object and one only; but one which is applicable to an indefinite number of objects—to as many, in fact, as the generic or universal term stands for. What, then, is the actual object of thought present to our minds when we use such a term? This was the subject of controversy; and various were the answers given to the question.

Those called the Realists maintained that there was a really existing thing corresponding to the universal terms, "man," "conqueror," "mountain," etc., as truly as there was corresponding to the singular terms, "Peter," "Julius Cæsar," "Ætna," etc. This really existing thing was not the same as that denoted by the name (for instance) of an individual mountain, *e.g.*, Ætna, or else the term would be not universal but singular; but yet, since the universal was applicable to the individual, this thing (whatever its nature) must exist *in* the individual, although distinct from it.

The Nominalists held, on the other hand, that it is the mere term or *name* of which we think when we employ a general or universal term. It is the *word* "mountain" or "tree" which is present to our thoughts, and not any *thing*, whether universal or particular.

Various intermediate views between these two extremes were advanced by different thinkers from time to time, which it is very often extremely difficult to distinguish one from another, and which it is unnecessary to enumerate here. Archbishop Whately's view, however, may be mentioned. According to him, the notion expressed by a universal term is merely an incomplete or inadequate notion of an individual. The complex idea represented by the universal term omits every circumstance which makes the individual differ from other individuals of the same class (whether genus or species), and only embraces all those common features which are to be found in all the individuals of the class, *i.e.*, in all those to which the universal term can be applied: *e.g.*, "If I omit the mention and the consideration of every circumstance which distinguishes Ætna from any other mountain, I then form a notion (expressed by the common term 'mountain') which *inadequately* designates Ætna (*i.e.*, which does not imply any of its peculiarities, or its numerical singleness), and is equally applicable to any one of several other individuals."

Having now shortly gone through the different rules of Logic, and seen its practical application, amongst other things, in the detection of erroneous reasoning; and having, we hope successfully, shown that the study is neither so uninteresting or so useless as is frequently asserted, it is necessary, to make our outline complete, to give a brief sketch of the history of Logic down to the present day, that its progressive development may be better seen.

The science, as we have it, comes from Greece, though parts of it have been developed independently in India and China. It was the fallacies and quibbles of certain of the "Sophists," or popular teachers of rhetoric and argumentation in Greece, that first stimulated logical inquiry. Zeno the Eleatic, by his ingenious paradoxes—the most celebrated of which, Achilles and the tortoise, has been referred to—contributed to the same end.

Socrates, according to Aristotle, was the first to give an account of induction and definition. But the Socratic induction was, in appearance, little more than a very imperfect induction by simple enumeration. It involved the assumption (never explicitly made by Socrates himself, but developed by Plato in his theory of Ideas) that the reason the instances taken are fair samples of the class to which they belong is, that each possesses the "essence"—that is, some attributes not merely *similar in* all the members, but actually *common to them*, and the foundation of their properties. This was developed by Plato in his theory of Ideas. The definition stated these "essential attributes." Thus, "Statesman" would be defined, after examining a number of examples, by stating those common attributes on which the rest were found to depend.

Plato developed this view in his theory of Ideas, which related, however, to *things in themselves* rather than to thought, and described elaborately division by dichotomy. The formula "Division should take place by real kinds" comes from him, and he is the true founder of the "Realism" familiar in the Middle Ages. In Book VI. of his "Republic" there is a striking conception of a system of the sciences—all of which are to be deduced from some single principle, and their affinity shown by the application of a kind of induction to their primary notions. But logical inquiry with Plato is only incidental to metaphysical.

But Aristotle is to be considered the first writer who attempted to treat logical questions by themselves and upon a systematic plan, although many of the subjects which (at least as his works have come down to us) he included within its limits would not be allowed a place in a logical treatise at the present day. Still most of the essential elements of pure Logic are to be found contained in the series of treatises by him called the "Organon." The analysis of the syllogism in particular is almost wholly due to him.

Those who bestowed any attention upon the study in the period immediately after that of Aristotle need not be noticed. The Stoics, indeed, are said to have invented the *name* of Logic, and also the threefold division of philosophy into logic, physics, and ethics. Nor is it necessary to dwell upon the writings of Alexander of Aphrodisias and the other Greek commentators on the works of Aristotle who flourished from the second and third centuries of the Christian era down to the end of the sixth. One of them, Porphyry, was the author of the fivefold classification of the predicables into genus, species, difference, property, and accident, already mentioned, and a passage in a logical treatise by him perhaps helped to suggest the controversy of Nominalists and Realists.

Boëthius, who lived in the sixth century, is the only Latin commentator upon Aristotle deserving of the name; and his works form the connecting link between the Greek writers upon Logic and the Schoolmen of later times.

The famous scholastic philosophy, including the periods of its infancy, progress, and decline, extended from the eleventh to the close of the sixteenth century. No doubt, in Logic, as in the other arts and sciences of which they pursued the study, the Schoolmen were too fond of over-subtle and refined inquiries; and upon this account they have been frequently treated with a contempt little merited by the ability or research which they devoted to almost every branch of learning with which the world was then acquainted; and with which they started subjects which the discoveries of later days have often enabled their successors successfully to investigate and follow up. Perhaps their chief service to the study of Logic was in fixing what may be called its terminology. They determined with a greater precision than had previously been exhibited the technical terms of the science, although they often carried to an extreme and wearisome degree of minuteness their distinctions between the various uses and significations of words in general. They also exhibited in many respects a truer and more exact conception of the nature and office of Logic than Aristotle had done; and it was with them that the famous controversy between the Nominalists and Realists, above referred to, was begun and mainly carried on. This, however, belonged in strictness to Metaphysics rather than to Logic.

From the time of the Schoolmen down to that of Kant, many names of more or less note occur; amongst which may be mentioned Bacon, Hobbes, Gassendi, Descartes, Leibnitz, and Wolf. Bacon, indeed, ridiculed the Deductive Logic of the schools as useless for research; but he formulated a method of Induction which, though unworkable in itself, contained striking anticipations of modern scientific methods, and suggested much of what J. S. Mill wrote on Induction. The famous German philosopher, Kant, has. however, done more for the science of Logic than any other writer from the days of Aristotle to our own time. He defined it, in his celebrated work called the "Critique of the Pure Reason," as "the science of the necessary laws of thought," and thus introduced a useful distinction between the *matter* and *form* of thought, upon which we shall make one or two remarks presently.

Of late years there has been a considerable revival in logical study, especially in Germany; and the great advances which have been made in the study of the mind will probably make it requisite to re-state some of the elementary definitions of the science. The names of Sigwart, Lotze, and Wundt may be mentioned in this connection; but in an elementary treatise no proper idea could be given of their work.

Logic has usually been popularly treated in the manner in which it has been by Aldrich and Archbishop Whately, as conversant with *reasoning* alone, to the exclusion of the other operations of the mind; but the more correct and scientific notion of it would make it embrace the analysis and consideration of the laws of *thought* in general, and not merely of the laws of reasoning in particular. This is the view of Sir W. Hamilton and Dean Mansel; and it is one which of course makes no practical difference in the rules such as have been already given with reference to syllogistic reasoning, but merely exhibits, as well as these, laws which are applicable to all thought, no matter on what employed, and which no sound *thinker* is at liberty to transgress, just as no sound *reasoner* can transgress the laws stated as applicable to the syllogism.

It will, then, be well, without entering into a deep metaphysical discussion, for which there is not space, to examine what are the different processes of thought to which the science of Logic is, according to these writers, to be applied. These are laid down as three—conception, judgment, and reasoning, of which the two latter processes have been already explained, and the first follows on simple apprehension.

In the product resulting in our mind from any act of thought, we must always distinguish between what is called the *matter* and what is called the *form*. The former is all that is given *to* the mind, from whatever source obtained, previous to the act of thought, and to enable it to perform it; while the latter is the shape given to these materials *by* the mind itself in the act of thought which it performs. Thus in conception the mind is *given* certain attributes, which it combines by the act of thought into a whole resembling and representing an object of intuition (*i.e.*, to explain it popularly, some object which we have learnt by means of sensation, perception, or imagination), to which a name is subsequently given: *e.g.*, my concept (as it is called) of "man" is made up by the act of conception of the given attributes of reason, life, etc.

By the act of judging, similarly, the concepts which are *given* are thought as being related in some manner to an object of thought (*e.g.*, as agreeing or disagreeing with it). Thus, when given the two concepts of "man" and "mortal," the mind, by the act of judging, connects them in the judgment, "man is mortal."

So also in reasoning, judgments are what are given to be combined by the act of the mind and thought as necessitating another judgment following from them as their consequence. Of this, after what has been previously said in treating of the syllogism, an example is unnecessary.

We thus have, in each of the three operations of thought, to distinguish carefully between the *matter* —attributes, concepts, judgments—and the *form* conveyed in and by the act of the mind.

The *process* of thinking, too, may in each case be either formal or material. It is formal when no further materials are necessary for completing the act of thought than those originally given; it is material when the contrary is the case, and the mind is obliged to have recourse to some other source besides itself and what it can supply unaided, before it can complete the process. Suppose, for instance, that when I am given two attributes—A and B—I am able to think them as co-existing together in an object, without having first to appeal to experience to learn whether any object is actually in existence which possesses them both, I have performed an act of formal conception. But if I have to wait for the evidence of experience, my act of conception becomes material. So also it is with judging and reasoning. Whenever the judgment or conclusion can be formed by the mind with the data originally given, and without the necessity of having recourse to the aid of experience, the process is formal; if otherwise, material.

Those, then, who regard Logic as the science of the laws of formal thinking, regard its province (considering it as a pure theoretical science, and not as applicable to other sciences) in each of these cases as being concerned only with what is formal, and as giving rules by which it can be accurately determined whether any of the laws of thought (which we cannot here discuss) have been in the process trangressed or not. That which is material, whether in the process or product of thinking, is in this view entirely outside its province. Whatever view we take on this latter question, the study of the form of thought apart from the matter is now so far developed that it has become possible to treat it by the aid of symbols, after the manner of algebra. This, however, is too large a subject to be dealt with here. The student who wishes to pursue this branch of the study may be referred to Venn's "Symbolic Logic."

We cannot better conclude these papers upon Logic than by quoting some remarks of Archbishop Thomson, in his "Laws of Thought":—"The attempt to apply the rules of Logic will both raise and lower the opinion which obtains concerning the worth of the science. Those who condemn it altogether, as arbitrary and artificial, as a set of rules for arguing, put together in an age when truth was less the object of desire than argument, may find to their surprise that it is only a searching and systematic account of processes which they daily perform, whether in thought or in argument, in the pursuit of a science or in the transactions of the street and market. Those, on the other hand, who expect that Logic will be to them a golden key to unlock the treasure-house of the knowledge of the universe, will find that it neither gives them, nor pretends to give, any new power; that it only refines and strengthens powers they already possess; that out of a dunce it never yet made a philosopher. Whilst its rules apply to every science, and it may therefore lay some claim to its ancient title—the Art of Arts, the Instrument of Instruments—it only assists us in the study of the sciences, not stands in their stead. We must fight our own way over every inch of ground in the field; but Logic will often prevent our throwing away our blows. . . . We only affirm that when men think, these are the rules according to which their thoughts run; that the knowledge of laws and principles, independent of ulterior profit, is always gratifying to active minds; and that, inasmuch as the clear understanding of what is right is always useful for the avoidance of what is wrong, Logic is a useful instrument in thinking. But it gives us the forms of knowledge, not the matter. It will not lay bare the hidden springs of moral action, nor explain the mystery of life, of sleep, of fancy, of memory; nor display the future destination of man in the world."

METEOROLOGY.—V.

[*Continued from p.* 288.]

THE MOISTURE OF THE ATMOSPHERE.

THE water-vapour in the atmosphere varies in amount in different regions, and at different times and seasons. It varies with the temperature and pressure, and with the neighbourhood of bodies of water. Its one source is evaporation. The volume of a gas alters with changes of temperature and pressure, and a vapour differs in this respect mainly in the fact that, with a moderate increase in the pressure or a slight fall of temperature, it will pass partly into a liquid or a solid form. A given mass of air at any particular temperature and pressure can only hold a certain quantity of water in the form of vapour. Lowering the temperature, increasing the pressure, or attempting to introduce more water-vapour, will cause some of the vapour to condense into the liquid or the solid state. On the other hand, if air be not *saturated*, if, that is,

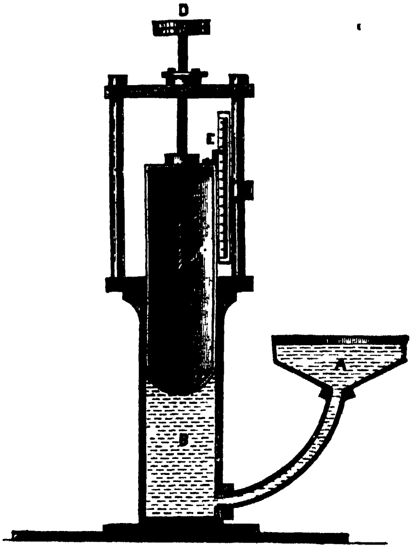

Fig. 14.—LAMONT'S ATMOMETER.

it do not contain as much vapour as it can, at its existing temperature and pressure, contain, it will continue to take up moisture in the form of vapour, *i.e.*, to cause *evaporation*, from any water with which it is in contact until it becomes so saturated. Evaporation is going on constantly, not only from the surface of the sea, of lakes, ponds, rivers, or other bodies of water, but from snow and ice, from the leaves of plants and from soils, even those which appear dry. Since condensation—or the passage of water-vapour back into water, the converse process to evaporation—is also constantly taking place in the formation of dew, mist, rain, snow, or hail, the amount of water-vapour in the air is constantly varying. The measurement of evaporation is termed *atmometry;* that of the amount of vapour in the air, *hygrometry;* and that of condensation, *hyetometry*.

Atmometry (from the Greek ἀτμίς, *atmis*, vapour) may be a matter of considerable practical importance, as, for instance, in the tropics, in estimating how far the utility of a water-tank will be lessened by the considerable loss by evaporation from its surface. Such measurements are, however, very difficult to carry out satisfactorily. In addition to the temperature, pressure, and dryness of the air, the amount of evaporation depends upon wind. As comparatively dry air passes over the surface of water, it takes up vapour, and fresh supplies of dry air following it take up more. If an *atmometer*, or instrument for measuring the amount of evaporation, be exposed, not only may birds bathe in it and splash the water, but rain falling into it will have to be deducted; while if the instrument be protected in a thermometer-screen, it will not afford a true measure of evaporation of water exposed to sun and wind.

Professor von Lamont, of Munich, invented the following form of atmometer (Fig. 14). An open basin or pan with a narrow opening below is connected by a tube with a cylinder in which a piston-plunger carrying a scale may be pressed down or raised by a screw through an air-tight collar. The scale is set at zero, and water is poured into the basin until cylinder and pipe are full and the water is exactly flush with the opening at the bottom of the basin or pan. The plunger is then screwed down until the water rises to exactly the level of the rim of the basin, so that no layer of air sheltered from wind rests upon it, but it is fully exposed. At the next observation the plunger is screwed up again until the water falls to the opening at the bottom, and the distance which its index then marks below the zero of the scale shows the amount lost by evaporation. A simpler instrument is that known as Piche's evaporator, a plain graduated glass tube, closed above like that of a barometer, filled with water, and having a disc of paper adhering to the ground edges of its lower end by atmospheric pressure. The paper remains constantly wet, evaporation taking place from its lower surface, and the loss is shown by the graduation.

Fig. 15.—Dines' Hygrometer.

The result of numerous atmometric observations in various parts of the world is that the amount of evaporation from the surface of water near the coast is about equal to the rainfall at the same place. For example, on the equator, rainfall is estimated to average 66·84 inches, and evaporation 66·15 in.; in London, rainfall 25·72 in., and evaporation 20·61 in. (*See* lessons in Physical Geography, Vol. I., pp. 208-9.)

In hygrometry, the measurement of the amount of moisture in the air, we may either determine directly, by some form of instrument including one thermometer, what the *dew-point*, or temperature at which the air is saturated under existing conditions of pressure, may be; or we may determine how far the air is removed from saturation indirectly in various ways.

The simplest direct *hygrometer* or *psychrometer* (from the Greek ψυχρός, *psychros*, cold) is that invented by Mr. G. Dines (Fig. 15). It is an open vessel containing very cold water, or ice and water, from which a pipe with a stop-cock leads under a sheet of black glass and round the bulb of a thermometer. On opening the tap the glass soon becomes dulled with a dew; on closing it the water in the tube rises in temperature, and, on its again reaching the dew-point, the dew clears from the glass.

A popular *hygroscope*, or instrument for indicating atmospheric moisture without measuring its amount, is a strip of seaweed, generally *Laminaria saccharina*, which, owing to its containing various hygroscopic or deliquescent salts, becomes damp in wet weather, and dries when there is less moisture in the air. Two toy hygroscopes depend for their action on the same principle, the tightening of a twisted piece of catgut when the air is dry, and its relaxing when the air is moist. In the one, the figure of a man or a woman comes out of a toy-house according as the weather is to be wet or fine; in the other, the cowl of the figure of a monk falls forward over his head or backwards on to his shoulders. An equally simple but far more useful instrument is the *hair hygrometer* of Saussure. It consists of a human hair, from which all grease is carefully removed, stretched, by a light weight, from a screw, the thread connecting the weight to the hair passing round the sheaf of a block which carries an index round a graduated arc. The instrument may be set by bringing it into air perfectly saturated with moisture, as indicated by the formation of cloud, and then tightening the screw till the index stands at 100 on the scale. The hair shortens as it dries. In cold climates this hygrometer, which is truly quantitative in its action, giving the percentage of humidity, is used in preference to Mason's dry and wet bulb hygrometer (*see* lessons in Physical Geography, Vol. I., p. 209) on account of the trouble caused by the freezing of the latter instrument. Mason's hygrometer, which is, however, much used, depends on the principle that evaporation lowers the temperature of neighbouring objects. The reason of this is that heat ("the latent heat of evaporation") is required to convert water into vapour, and is, therefore, withdrawn from neighbouring objects. Just, therefore, as we cool wine by wrapping a wet cloth round the bottle and putting it in the sun or before the fire, so, unless the air is saturated with moisture, the wet-bulb thermometer always indicates a temperature lower than that shown by the dry bulb. When the air is saturated the two thermometers will read alike, and the difference between them increases with increased dryness of the air. The temperature of the *dew-point* may be obtained by multiplying the difference between the temperatures of the wet and dry bulb by one of a series of numbers, known as *Greenwich* or *Glaisher's factors*, which vary with the temperature of the air at the time, and subtracting the product from the temperature of the air. The following are the factors:—

Dry-bulb temperature F.°	Factor.	Dry-bulb temperature F.°	Factor.
Below 24°	8·5	34—35	2·6
24 to 25	7·3	35—40	2 5
25—26	6·4	40—45	2·3
26—27	6·1	45—50	2 1
27—28	5·9	50—55	2·0
28—29	5·7	55—60	1·8
29—30	5·0	60—65	1·8
30—31	4·6	65—70	1·7
31—32	3 6	70—75	1·5
32—33	3·1	75—80	1·3
33—34	2·8	80—85	1·0

From the dew-point we may calculate the *vapour tension*, or *elastic force* of the vapour present, often erroneously called the *absolute humidity*. By this we mean what height of mercury the vapour present would raise at that temperature, or, what is the same thing, to what extent would water-vapour at that temperature, if introduced into the Torricellian vacuum, depress the mercury below its height in the ordinarily vacuous barometer. This was calculated by Dulong, Arago, and Regnault in millimetres, as in the following table, though with us it is usually expressed in decimals of an inch:—

Temperatures (Centigrade).	Tensions in millimetres.	Temperatures (Centigrade).	Tensions in millimetres.
0	4·60	60	148·79
5	6·53	70	233·09
10	9·17	80	354·64
15	12·70	90	525·45
20	17·39	100	760·00
30	31·55	110	787·03
40	54·91	120	1520·00
50	91·98	160	4580·00

We may also calculate the *relative humidity*, *fraction of saturation*, or *hygrometric state* of the air, or ratio of this actual tension to the tension of vapour saturating the air at the same temperature. For example, supposing the temperature of the air to be 15° C. and the dew-point 5° C., then the tension is 6·53 millimetres, whilst that of saturation would be 12·70 millimetres, or nearly twice as much, so that the ratio or hygrometric state is ·514.

From the vapour-tension we can also calculate, though it is usually found by tables, the weight of water in a cubic foot of air.

The relative humidity may also, of course, be expressed as a *percentage of saturation*, taking complete saturation as 100, as in observations made by the hair-hygrometer.

Such facts as these are included in the daily reports of the *Times* for London and for Ben Nevis, the highest observatory in the British Isles. The following are the reports given on January 1st, 1892, of which day we have already given the barogram:—

TEMPERATURE AND HYGROMETRIC CONDITION OF THE AIR IN LONDON. (December 31—January 1.)

Hours of Observation.	Temperature.		Tension of Vapour.	Weight of Vapour in 10 cub. ft. of Air.	Drying Power of Air (per 10 cubic feet).	Humidity (Saturation = 100).
	Air.	Dew-Point.				
	Deg.	Deg.	Inches.	Grains.	Grains.	Per cent.
Noon	50	46	·311	36	5	88
9 p.m.	47	40	·247	29	8	78
2 a.m.	43	39	·238	28	4	88

Minimum temperature, 43 deg.; maximum temperature 54 deg.

BEN NEVIS OBSERVATORY, DEC. 31.

SUMMIT STATION (4,407 ft. above sea level).

	Bar.	Temperat.		Wind.		Cloud.	
	At 32°.	Dry Bulb.	Wet Bulb.	Direction.	Force. 0 to 6.	Species.	Amount 0 to 10.
	In.	Deg.					
9 a.m.	25·652	22·2	Sat.	N.	0	Fog.	10
9 p.m.	24·891	23·9	Sat.	N.N.W.	1	Fog.	10

Maximum temperature, 25·0 deg.; minimum temperature, 20·0 deg. Black bulb, —. Sunshine, none. Rainfall, 0·018 in.

BASE STATION (42 ft. above sea level).

	Bar.	Temperat.		Wind.		Cloud.	
	At 32°.	Dry Bulb.	Wet Bulb.	Direction.	Force. 0 to 6.	Species.	Amount. 0 to 10.
	In.	Deg.	Deg.				
9 a.m.	29·156	36·8	35·9	Calm.	0	Stratus.	10
9 p.m.	29·421	38·8	37·7	Calm.	0	Nimbus.	10

Maximum temperature, 42·2 deg.; minimum temperature, 34·0 deg. Black bulb, 62. Sunshine, 3 min. Rainfall, 0·275 in.

Notes for the 24 hours.—Barometer rising since 5 a.m. Temperature about steady at both stations. Light north-westerly or northerly winds, with fog and heavy showers of snow, on summit. Light variable southerly or south-westerly winds, with cloudy sky and showers of rain, below. Depth of snow on summit, 51 in.

As to *hyetometry* (from the Greek ὑετός, *huĕtos*, rain) there is comparatively little we need add to what is stated in the lessons on Physical Geography (Vol. I., pp. 210-214).

Dew is the precipitation of atmospheric moisture in liquid form without the formation of visible cloud.

Hoar-frost is not frozen dew, being deposited directly in the solid form when the dew-point is below the freezing-point. Thus, gardeners finding the dew-point to be above 32° F. in the evening, need not fear the destructive action of hoar-frost on their tender plants.

Whilst neither dew nor hoar-frost are likely to be formed when there is wind, a most dangerous and destructive phenomenon known as *verglas*, or *glazed frost*, is the direct result of wind. A slight thaw moistens the air, and a comparatively warm moist wind passes over the still cold ground, parting with its moisture as a sheet of ice deposited upon everything. A slight shower may make matters worse, as happened in London more than once during the winter of 1891-92.

The proportion of cloud in the sky is stated—as seen in the *Times'* report—as ranging from 0, clear blue sky, to 10, a sky entirely overcast; but we may give here the table of letter symbols used on our charts, and known as *Beaufort's weather notation*:—

b. Blue sky, whether with clear or hazy atmosphere.
c. Detached clouds.
d. Drizzling rain.
f. Fog. *g.* Very gloomy.
h. Hail. *l.* Lightning.
m. Misty, hazy atmosphere
o. Overcast, the whole sky covered, with impervious cloud.
p. Passing, temporary showers.
q. Squally.
r. Continued rain.
s. Snow.
t. Thunder.
u. Ugly, threatening weather.
v. Visibility.
w. Dew.

Observations now extending over more than a century show that the black spots seen on the surface of the sun vary in number and size, maxima recurring at intervals of about eleven years. The maxima and minima of sun-spots coincide very closely with the maximum and minimum numbers of auroras in successive years. The *aurora borealis*, or Northern Lights, is apparently an electric discharge around the magnetic poles of the earth. Less closely coincident eleven-year cycles have been traced in rainfall and droughts, good wine years and harvests, the number of shipwrecks, famines, and times of commercial speculation, crises, or panics. These phenomena can easily be shown to be dependent upon one another and thus indirectly upon the sun's action; but, though variations in this action may have a general effect upon the circulatory movements of our atmosphere, weather depends upon the changes in the form of the isobars, *i.e.*, upon cyclones, anticyclones, etc. Though, therefore, sun-spots may affect the number and size of cyclones, they can hardly determine their course, and can be of no use in forecasting the weather of any one locality.

BRITISH COMMERCE.—VII.

[*Continued from p. 285.*]

WINE.

WINE arrives in casks or in bottles. The quantity received in 1890 in casks was 13,679,778 gallons, of the declared value of £3,296,803; the quantity in bottles, 2,514,329 gallons, of the declared value of £2,590,064. Thus, though the quantity received in casks exceeded by more than five times the quantity received in bottles, its value was not half as much again as the value of the bottled wine. This, of course, is what one would naturally expect. The total import of wine, therefore, was 16,194,107 gallons, of the declared value of £5,886,867—nearly two millions sterling in excess of the value of our coffee imports and one-fourth of the value of our imports of wheat—and the gross amount of duty received was £1,325,289. These figures show that the wine trade is one of considerable magnitude.

As to the countries contributing these supplies, the lead is taken by France, "the vineyard of the world." The amount from that country was 6,262,738 gallons, of the declared value of £3,240,167. After France in quantity, though not in value, comes Spain with 4,007,085 gallons, of the declared value of £908,825, while against Portugal's 3,991,359 gallons is set a value of £1,189,397. Other countries, in the order of the quantities sent by them, are Germany, 500,211 gallons, valued at £64,023; Holland, 420,951 gallons, valued at £249,465; Italy, 357,011 gallons, valued at £73,414; Australasia, 315,113 gallons, valued at £56,979; Madeira, 86,137 gallons, valued at £35,267; and Canary Islands, 82,418 gallons. valued at £14,682.

These wines pass under the general designations of red and white, sparkling and still. The amount of red wine was 10,724,907 gallons; of white wine, only 5,469,200 gallons. The value of the latter, however, was £3,252,113, while of the former it was only £2,634,754. This is explained by the fact that most of the bottled wines are white, champagne alone accounting for £2,014,325. As regards the amounts of still wine in bottles and sparkling wine, the former was 720,138 gallons, of the value of £415,046, while the latter was 1,794,191 gallons, of the value of £2,175,018.

For a general description of the process of wine-making, the following from Mr. Yeats's "Natural History of Commerce" will suffice:—"The grapes are gathered into baskets, which are emptied into a tub, with holes at the bottom, called the wine-press. This tub is placed over another much larger, named the wine-vat. A man then gets into the upper tub and presses or crushes the grapes by treading upon them, a mode of bruising the grape as ancient as wine-making itself. The juice or *must*, as it is termed, flows from the press into the vat, and sometimes within a few days, or even a few hours, depending on the temperature, begins to ferment. This fermentation makes the liquor turbid, increases its temperature and volume, so that it soon fills the vat. After a time the fermentation ceases, the liquor diminishes in temperature and bulk, and becomes cool and clear. When quite cold it is drawn off, or racked, from the vat by a tap placed a few inches above the bottom, into an open vessel, whence it is conveyed into the cask prepared for its reception. After entering the cask, a second although much slighter fermentation takes place, which further clarifies the wine; its subsidence diminishes the bulk of the wine in the cask, and more wine is added, so as nearly to fill the cask. This again slightly renews the fermentation, and the cask is kept open until filled to its utmost capacity with wine free from fermentation; it is then closed and is ready for the market."

Among the wines of the world the leading position is assigned to champagne, which derives its name from the old province of Champagne, where the art of making effervescing wines originated. This province is now represented by the departments of Marne, Haute-Marne, Aube, and Ardennes. The vintage takes place early in October, and comprises both red and white grapes. The delicate operations in the production of this wine commence with the bottling. The bottles are selected with great care, those with the least flaw in them being useless, as even great numbers of perfectly sound bottles burst during fermentation. After being bottled and the corks secured by a clip, the bottles are allowed to lie on their sides during the summer, and the sediment is thus deposited on the sides of the bottles. Removed next to cool cellars, the bottles are then placed in racks in a slanting position head downwards, and slightly shaken every day, to force the sediment on to the cork. This goes on for several weeks, when, the clips being removed from the corks, these come out and with them the sediment. The wine is now liqueured to regulate the sweetness, and finally corked for the market.

It is this process of removing the sediment that makes it necessary for champagne bottles to have sloping shoulders; in ordinary bottles it is evident that the fall of the sediment to the cork would be interrupted by the sharp corners at the bottom of the neck. In effervescing wines there are three grades: *crémant*, wine with a pressure on the bottle of less than four atmospheres; *mousseux*, a pressure of from four to four and a half atmospheres; and *grand mousseux*, a pressure of five atmospheres. These different pressures are due to the presence of more or less carbonic acid. Cheap champagnes are produced from ordinary wine, to which sugar and flavouring matter are added and then carbonic acid pumped in. The popular notion that spurious champagne is made of gooseberry juice is erroneous. It is not the material that champagne is made of that makes it dear—it is the skill, labour, and time. The grapes themselves are as cheap and plentiful as ever gooseberries are.

Though champagne ranks so highly amongst wines, it is not by any means a high-class natural wine. Distinction in this regard attaches peculiarly to the produce of the Médoc district, on the banks of the Gironde. The Médoc wines are so highly prized that the produce of the different vineyards are kept distinct, and enjoy characteristics that commend them to the tastes of the different consumers. In consequence of this, these wines generally enter the market under the designation of the particular growth and the particular year of their yield.

The Médoc vintage takes place towards the end of September, overlapping into the beginning of October. After gathering the grapes are conveyed to the press-house, where they are freed from stalks and then thrown into vats. In about a fortnight, fermentation having set in, the wine is drawn off into hogsheads, which are then removed to airy stores. "The first month the bung is put lightly in, and the cask filled up every three or four days; the second month it is put in more firmly, and the cask filled every eight days. In March, the lees having fallen, the first *soutirage*, or drawing-off, takes place. A second is made in June and a third in November, after which the hogsheads are turned on their side and the fillings-up cease. In the second and following years, after the wine has been removed to dark cellars, two drawings-off suffice, one in spring and the other in autumn. After this, if the wine ferments, it is drawn off in a sulphured cask, and, if necessary, fined with eggs and again drawn off in a fortnight." Such is the process of preparing the best clarets known to English consumers. The chief vintages of these wines during the present century are given as those of 1815, 1825, 1828, 1831, 1834, 1841, 1847, 1848, 1858, 1864, 1869, 1870, 1874, 1875, and 1885.

A well-known white wine from Médoc is Sauterne, so named from the district where it is grown, and which lies to the south of Bordeaux. Here the vintage takes place towards the end of October, lapping over into November. The grapes, which are white, are gathered with great care and when they might be described as over-ripe and as having begun to ferment while still on the vine. They are not vatted as the other grapes are, but immediately pressed and the juice allowed to continue to ferment by itself. The finer classes of this wine, like the château-bottled red wine of Médoc, are bottled previous to shipment, the corks being inscribed with the name of the château and the vintage. The finest growth of Sauterne is Château Yquem, which is classed as a growth by itself and usually fetches a fourth more in price than the ordinary first growths, which vary considerably, reaching a figure as low as £8 a hogshead and as high as £60.

A favourite sparkling wine, the trade in which with England dates from 1874, comes from the produce of the vineyards of Saumur, a district in the department of Maine-et-Loire. It is a good and wholesome wine, and at the Paris Exhibition of 1878 it was pronounced by the judges to correspond in sweetness and lightness to champagne, to be equally white, clear, and sparkling, to possess in nearly the same proportions the same substances as the wines of Champagne. These circumstances, coupled with its much lower price, have contributed to make the produce of Saumur popular. This wine is made from black grapes pressed *en blanc*, the white grapes being gathered fourteen days later than the other. In the manufacture of sparkling Saumur half of "each year's must is put in barrels by itself to ferment and become wine, and is kept to be mixed with one-half of the next year's must. In the following May the mixture is put into bottles to undergo its second fermentation, which is induced in the same manner as champagne, the wine being treated in precisely the same manner. The sediment is also worked into the neck in a similar manner, and is thrown off by the system of disgorgement." Natural conditions connected with its situation lend to Saumur special advantages in producing sparkling wines. Behind it lies a range of hills which provide easy and first-class cellarage. These hills are extensively excavated, and with no trouble thus afford storage of equable temperature.

After Médoc, in the matter of red wines, comes Burgundy, the district comprising the departments of Yonne, Côte-d'Or, and Saône-et-Loire, and on the southern borders of Champagne. Of Burgundy, the finest quality is produced in the communes of Nuits and Beaune, in the department of Côte-d'Or. Chablis is a commune of Yonne, and yields a well-known white wine of the same name. Another well-known product of Burgundy is Macon, made from vineyards near that town in the department of Saône-et-Loire.

The departments of Charente and Charente-Inférieure, which are north of the Gironde and lie on the Bay of Biscay, produce the wine that brandy is distilled from. Though the natural wine is of inferior quality, like the natural wine of Champagne, yet it cannot be equalled for brandy-making purposes.

After France, as a wine-producing country, may be placed Spain, and among its produce of this commodity the first place is occupied by sherry, so named from Jerez de la Frontera, the centre of the sherry-making industry. In France, the grower of the grapes generally makes the wine; in Spain, however, it is different. Here the wine-maker purchases the fruit or the juice from the grower, and converts it into the finished product. The best known variety of sherry in this country is Amontillado, of which there are two classes—Fino and Oloroso. Another Spanish wine is known here as "tent" (*tinto*); it is a red wine produced in the district of Rota, and is used mainly for sacramental purposes.

From the adjacent country of Portugal comes the other familiar wine, port. It is produced in the district of Alto Douro in the north-east, and derives its name from its port of shipment, viz., Oporto, The gathering of the grapes commences towards the end of September, and is done mainly by women and children. After the stalks have been removed, the grapes are emptied into stone tanks and then

The *doing* is indicated by the following terminations:—

(1) -τις, -σις, -σια (from -τις). The nouns hereto belonging are all feminine, as:—πίστις, *confiding, trust, faith* (from πιθ-, as in πείθομαι); μίμησις, *imitation* (from μιμε-, as in μιμέομαι); σκέψις, *consideration* (from σκεπ-, as in σκέπτομαι); πρᾶξις, *handling, action* (from πραγ-, as in πράσσω); γένεσις, *begetting* (from γεν-, as in γίγνομαι); δοκιμασία, *proving* (from δοκιμαδ-, as in δοκιμάζω).

(2) -μος: as σπασμός, *cramp, spasm* (from σπα-, as in σπάω); δεσμός, *chain* (from δε-, as in δέω); ὀδυρμός, *wailing* (from οδυρ-, as in ὀδύρω).

The *result* of action is denoted by—

(1) -μα (neuter): as πρᾶγμα, *a thing done* (from πραγ-, as in πράσσω); ῥῆμα, *a thing spoken* (from ῥε-, as in ἐρῶ); τμῆμα, *a cut* (from τεμ-, as in τέμνω).

(2) -ος (neuter): as λάχος, *a lot* (from λαχ-, as in λαγχάνω, aor. ἔλαχον); ἔθος, *custom* (from εθ-, as in εἴωθα); τέκος, *a child* (from τεκ-, as in τίκτω, aor. ἔτεκον).

The same suffix in derived words denotes the peculiar quality, as:—

βάρος, *weight*,	adj. stem	βαρύ-,	nominative	βαρύς.
βάθος, *depth*	„	βαθύ-	„	βαθύς.
μῆκος, *length*	„	μακρό-	„	μακρός.

The *instrument* or *means* of an action is denoted by -τρο, nom. -τρον, neuter (the Latin *-trum*):—

ἄροτρον, *a plough* (from αρο-, as in ἀρόω; Lat. *aratrum*).
λύτρον, *a ransom* (from λυ-, as in λύω).
δίδακτρον, *a teacher's fee* (διδαχ-, as in διδάσκω).

Less definite is the meaning of the related feminine suffix -τρα, as:—ξύστρα (ξύω, *I shave*), *a curry-comb;* ὀρχήστρα (ὀρχέομαι, *I dance*), *a dancing-place*, our *orchestra;* παλαίστρα (παλαίω, *I wrestle*), *a wrestling-place.*

Place is signified by—

(1) -τήριον, neuter (the Latin *-torium*): as ἀκροᾱτήριον, *a place for hearing* (Lat. *auditorium*), from ἀκροα-, as in ἀκροάομαι; δικαστήριον, *a judgment-hall*, from δικαδ-, as in δικάζω.

(2) -εῖον (neuter): as λογεῖον, *a speaking-place*, from λογο-, as in λόγος; κουρεῖον, *a barber's shop*, from κουρευ-, as in κουρεύς; Μουσεῖον, *a museum*, from Μοῦσα, as in Μοῦσα.

Substantives denoting *quality* are derived from adjective stems by means of the following suffixes:—

	NOMINATIVE.	ADJ. STEM.	NOMIN.
1. -της (f.),	ταχύτης, *quickness.*	ταχυ-.	ταχύς.
Lat. *-tas*,	νεότης, *youth.*	νεο-.	νεός.
-tus.	ἰσότης, *equality.*	ισο-.	ἴσος.
2. -συνη (f.),	δικαιοσύνη, *justice.*	δικαιο.	δίκαιος.
	σωφροσύνη, *sense.*	σωφρον-.	σώφρων.
3. -ια (f.)	σοφία, *wisdom.*	σοφο-.	σοφός.
	εὐδαιμονία, *happiness.*	εὐδαιμον-.	εὐδαίμων

The suffix -ια with the vowel of the adjective stem becomes -εια and -οια:—

	ADJ. STEM.	NOMINATIVE.
ἀλήθεια (αληθε-ια), *truth.*	ἀληθε(ς).	ἀληθής.
εὔνοια (ευνο-ια), *benevolence.*	εὐνοο-.	εὔνους.

Diminutives, or words denoting the quality in a less degree, are formed from nouns as stems by means of these suffixes:—

(1) -ιον (neuter): as παιδίον, *a little child*, stem παιδ-, nom. παῖς; κηπίον, *a little garden*, stem κηπο-, nom. κῆπος. Besides the form -ιο there are these—namely, -ιδιον, -αριον, -υδριο (υδριον): as οἰκίδιον, *a little house* (οἶκος); παιδάριον, *a little child* (παῖς); μελύδριον, *a ditty* (μέλος, *a song*, our *melody*).

(2) -ισκος, -ισκη: as νεανίσκος, *a youth*, stem νεανια-, nom. νεανίας; παιδίσκη, *a little maiden*, stem παιδ-, nom. παῖς.

Patronymics, or nouns denoting descent from a father (πατήρ)—that is, an ancestor—are formed mostly by the suffix -δης for the masculine, and merely -ς for the feminine (δ being lost). This suffix is added immediately to the stem in -α: as—

MASCULINE.	FEMININE.	NOMINATIVE.
Βορεάδης.	Βυρεάς.	Βορέᾱς, *the north wind.*
Αἰνειάδης.		Αἰνείᾱς, *Æneas.*

To consonantal stems the suffix is appended by means of the vowel ι: as Κεκροπιδης (masc.), Κεκροπίς (fem.), from Κέκροψ, *Cecrops.*

Stems in ευ and ο of the third declension also take the connecting vowel ι, before which the υ disappears:—

Πηλείδης, from Πηλεύς. Λητοίδης, from Λητώ.

The ο of the second declension is replaced by ι: as—

MASCULINE.	FEMININE.	NOMINATIVE.
Ταντᾰλίδης.	Ταντᾰλίς, from original	Τάνταλος.
Κρονίδης.	„ „	Κρόνος.

Only ιο (nom. -ιος) is changed into ια: as—

MASCULINE.	FEMININE.	NOMINATIVE.
Θεστιάδης.	Θεστιάς, from original	Θέστιος.
Μενοιτιάδης.	„ „	Μενοίτιος

A less frequent suffix for patronymics is -ιων: as Κρονίων, *son of* Κρόνος.

Gentilia, or nouns denoting the *gens* or race, the country or the tribe whence a person is sprung, have the suffixes :—

(1) *-ευ* (nom. *-ευς*): as **Μεγαρεύς**, from the noun-stem **Μέγαρο**, nom. **τὰ Μέγαρα**, *Megara ;* **'Ερετριεύς**, from the noun-stem **'Ερετριο**, nom. **'Ερετρία**. Feminine *gentilia* end in **-δ** (nom. **-ς**): as **Μεγαριδ-**, nom. **Μεγαρίς**, *a woman of Megara ;* **Σικελιωτιδ-**, nom. **Σικελιῶτις**, *a woman of Sicily*.

(2) *-τα* (nom. *-της*) : as **Τεγεάτης** (**Τεγέα**), **Αἰγινήτης** (**Αἴγινη**), **'Ηπειρώτης** (**"Ηπειρος**), **Σικελιώτης** (**Σικελία**).

ADJECTIVES.

The most important suffixes for the formation of adjectives are these :—

(1) *-ιο* (nom. *-ιος*) expresses in the most general way the idea involved in the noun from which the adjective comes : as *οὐράνιος*, *heavenly* (from the noun *οὐρανός*, *heaven*). By appending *ιο* you also form adjectives from adjectives as stems, as *ἐλευθέριος*, *liberal*, from *ἐλευθερ-* (*ἐλεύθερος*, *free*) ; also gentile adjectives from names of places—thus, from **Μίλητος** comes **Μιλήσιος**, and from **'Αθῆναι** comes **'Αθηναῖος**.

(2) *-κο* (nom. *-κος*), which is generally appended to the stem by means of *ι*, and in words derived from verbal stems signifies *fitness :* as, from *αρχ-* (*ἄρχω*) comes *ἀρχικός*, *fit for governing*. From nouns as stems are formed adjectives which denote the peculiar quality of the noun : as *βασιλικός*, *kingly* (*βασιλεύς*, *a king*).

(3) *-ινος*
(4) *-εος*, *-ους* } indicate the stuff or substance of which a thing is made : as *λίθινος*, *stony*, from *λίθος*, *a stone ;* *χρύσεος*, *χρυσοῦς*, *golden*, from *χρῦσος*, *gold*.

(5) *-εις* (fem. *-εσσα*, neut. *-εν*) denotes *fulness :* as *χαρίεις*, *full of grace* or *beauty* (from *χάρις*, *grace*, *beauty*) ; *ὑλήεις*, *full of wood* (from *ὕλη*, *a wood* or *forest*).

VERBS.

Verbs are in various ways formed from nouns as stems. In the ensuing list the verbs are arranged according to their terminations, as they appear in the present tense :—

(1) *-οω* : as *μισθόω*, *I hire* (from *μισθός*, *wages*, *reward*) ; *χρυσόω*, *I gild* (*χρῦσος*, *gold*).

(2) *-αω* : as *τιμάω*, *I honour* (*τιμή*, *honour*) ; *αἰτιάομαι*, *I accuse* (*αἰτία*, *cause*, *blame*).

(3) *-εω* : as *ἀριθμέω*, *I number* (*ἀριθμός*, *number*) ; *εὐτυχέω*, *I am fortunate* (*εὐτυχῆς*, *fortunate*).

(4) *-ευω* : as *βασιλεύω*, *I am a king* (*βασιλεύς*, *a king*) ; *βουλεύω*, *I counsel* (*βουλή*, *counsel*).

(5) *-ιζω* : as *ἐλπίζω*, *I hope* (*ἐλπίς*, *hope*) ; **'Ελληνίζω**, *I speak Greek* (**"Ελλην**, *a Greek*).

(6) *-αζω* : as *δικάζω*, *I judge* (*δίκη*, *justice*) ; *ἐργάζομαι*, *I labour* (*ἔργον*, *labour*).

(7) *-αινω*: as *σημαίνω*, *I signify* (*σῆμα*, *a sign*) ; *λευκαίνω*, *I whiten* (*λευκός*, *white*).

(8) *-υνω* : as *ἡδύνω*, *I sweeten* (*ἡδύς*, *sweet*) ; *λαμπρύνω*, *I adorn* (*λαμπρός*, *brilliant*).

From the same noun as a stem may be derived several verbs, having different terminations and different meanings ; thus, **δουλο-**, **δοῦλος**, *a slave ;* **δουλόω**, *I enslave ;* **δουλεύω**, *I am a slave ;* **πολεμο-**, **πόλεμος**, *war ;* **πολεμέω** and **πολεμίζω**, *I carry on war ;* **πολεμόω**, *I set in hostilities*.

Verbs may also be formed from verbs. There are three classes of verbs which set forth the idea conveyed by the primitive verb under certain modifications. These are called *frequentative*, *inchoative*, and *desiderative*. The frequentative are those verbs which denote a repetition of the act ; the inchoative, those which denote the commencement of the act ; and the desiderative are those which express a desire towards that which the primitive declares.

(1) *Frequentatives.*—Frequentatives are formed partly from the unchanged stem by means of the terminations *-αζω*, *-ιζω*, *-υζω*; partly by the conversion of the stem-vowel into *ο* with the termination *-εω*, or by the lengthening of *ο* into *ω*, the termination *-αω* being added ; for example, *στενάζω*, *I groan frequently* (from *στένειν*, *to groan*) ; *αἰτίζω*, *I ask often*, *I beg* (from *αἰτεῖν*, *to ask*).

(2) *Inchoatives.*—Inchoatives are formed by the addition of the termination *-σκω* : as *μεθύσκω*, *I am addicted to drunkenness* (from *μεθύειν*, *to use strong drink*) ; *ἡβάσκω*, *I become an adult* (from *ἡβᾶν*, *to be an adult*).

(3) *Desideratives.*— Desideratives are generally formed from the first future of the primitive verb by the addition of the termination of *-ειω* : as *γελασείω*, *I desire to laugh* (from *γελᾶν*, *to laugh*) ; *πολεμησείω*, *I wish to be in war* (from *πολεμεῖν*, *to make war*). Desideratives are formed also from verbal substantives by means of the terminations *-ιαω* and *-αω* : as *κλαυσιάω*, *I wish to weep* (from *κλαῦσις*, *weeping*) ; *στρατηγιάω*, *I wish to be a general* (from *στρατηγός*, *a general*) ; *θανατάω*, *I desire death* (from *θάνατος*, *death*).

COMBINATION.

Besides primitive and derivative words, the Greek language has compound words—*i.e.*, words which are made up of two words or more, and are designed to express complex ideas. To the multitude of compounds which the Greek possesses that language at once owes its richness and its exactitude, so that by means of a compound possessing two or three components it expresses that for the full utterance of which several words would be required in English. For example, ὑπεκφεύγω (ὑπό, *from*, ἐκ, *out of*, and φεύγω, *I flee*) signifies *I flee home out of a place away from someone;* and προκαταλαμβάνω (πρό, *before*, κατά, *down*, and λαμβάνω, *I take*) signifies *I take something before someone else.* We may observe a few instances of such compounds: *e.g.*—

A noun which in combination takes the first place appears in its stem-form: as—

ἀστυ-γείτων,	χορο-διδάσκαλος,	σακες-φόρος,
city-neighbour, neighbouring city,	*choir-teacher, teacher of dancing*,	*shield-bearing, warrior*,

where ἄστυ, χορο (χόρος), and σακες (σάκος, *a shield*) are in the stem-form.

Consonantal stems are in general united with the second compound by the connecting-vowel ο: as ἀνδριαντ-ο-ποιός, *image-maker ;* πατρ-ο-κτόνος, *father-slayer*.

This connecting ο is found also after short vowels: as φυσιολόγος, *nature-investigator ;* ἰχθυοφάγος, *fish-eater ;* and is the regular representative of an α in the stem—as ἡμεροδρόμος, *day-runner*, where the first component is ἡμέρα, *a day*.

The ο disappears before a vowel: as χορ(ο)ηγός, *a choir-leader ;* πατράδελφος, *father's brother*. Yet it remains in words which originally began with the aspirate which is called the digamma, equivalent to our *v*, as ἔαρ (in Latin *ver*), *spring ;* εἴκοσι (Doric Fικοτι, Latin *viginti*) ; ἔργον—*e.g.*, δημιοεργός (Homeric), δημιουργός (Attic), *hand-worker.*

The termination of a word is often in combination somewhat changed, especially if the compound is an adjective. Thus, τιμή becomes τιμος, and πρᾶγμα, πράγμων: for example, φιλό-τιμος, *honour-loving ;* πολυ-πράγμων, *much-doing* (*a busybody*).

The termination -ης (masculine and feminine) and the termination -ες (neuter) deserve attention. They are appended—

(1) To many adjectives formed immediately from verbal stems: as ἀβλαβής, *uninjured ;* αὐταρκής, *self-sufficient*.

(2) To adjectives whose second component has arisen from a substantive in -ες (nominative -ος): as δεκαετής, *ten-year-old ;* κακοηθής, *bad-mannered*.

Without changing its nature a verb cannot be combined with any word except a preposition. If another word is united with a verbal stem, the two unite to form a noun—thus, out of λίθος, *a stone*, and βάλλω, *I throw*, is formed λιθοβόλος, *a stone-thrower*. Hence a verb may be formed, as λιθοβολέω, *I throw stones.* So from ναῦς and μάχομαι we have ναύμαχος, *a sea-fighter*, and thence ναυμαχέω, *I fight by sea ;* also, from εὖ and ἐργ- comes εὐεργέτης, *a benefactor*, and εὐεργετέω, *I act as a benefactor.*

A substantive with an abstract signification may unite with a preposition only by retaining its own termination—thus, βουλή, *a determination*, becomes προβουλή, *a pre-ordination.* In every other combination an abstract noun must assume a derivation-ending—thus, λίθος and βολή (βαλλω) give rise to λιθοβολία, *stone-throwing ;* ναῦς and μάχη give rise to ναυμαχία, *a sea-fight ;* and εὖ and πρᾶξις give rise to εὐπραξία, *a good condition* (*well-being, weal*).

In regard to signification, compounds may be divided into three classes: *Determinatives*, *attributives*, and *objectives*.

The *determinatives* are those compounds in which the secondary component determines the exact meaning of the primary, and in these the second word is the primary or chief word. These compounds are the least numerous: as ὁμόδουλος, *a fellow-slave ;* ἀκρόπολις, *the lofty city* (acrópolis).

The *attributives* are those in which also the second word is determined by the first, but the idea formed by the two is *attributed* as a quality to another word. Thus, ὁμότροπος signifies not *the same kind* (τρόπος), but *being of the same kind, having the same disposition ;* and μαχρύχειρ is not *a long hand*, but *having a long hand* or *being long-handed.*

The *objectives* are those in which one element is governed by the other, the latter being *the object* to the former: thus, δεισιδαίμων, *superstitious, god-fearing*, where, as in *god-fearing*, δαίμων is governed by δεισι, and the word is equivalent to τοὺς δαίμονας δειδώς, *fearing the divinities.* So ἡνίοχος, *rein-holding*, is the same as τὰ ἥνια ἔχων. In the same manner consider λογογράφος, *speech-writer* (historian or *fabulist*) ; ἀξιόλογος, *worthy of record ;* and χειροποιητός, *hand-made* (that is, *made by the hand*, χερσὶ ποιητός). Sometimes the first component is the object, sometimes the second. Especially common are compounds with the prefix ἀν- (ἄνευ, Lat. *sine*, without), which before consonants becomes α-, and which, on account of its negative or privative force, is termed *alpha privative:* as ἄγραφος, *unwritten ;* ἀμήτωρ, *motherless* (or in form more exactly, *un-motherly*).

The prefix εὖ, *well*, and the prefix δυς, *hardly, with difficulty*, form many compounds: for example, εὔτοκος, *easily-bearing ;* δυσάρεστος, *displeased.*

VERBAL ADJECTIVES.

Verbal adjectives have two endings—one in -τος, the other in -τεος. Those in -τος resemble in signification the Latin participle in *-tus*, as :

(*factus*), that is, *made*; so γραπτός (*scriptus*), *written*. Many, and perhaps the greater number of them, more nearly approach the Latin adjectives in *-bilis*, as θαυμαστός (*mirabilis*), *admirable*; or they express a simple possibility, as ὁρατός, *visible*, *an object that may be seen*; ἀκουστός, *audible*.

Verbal adjectives in -τεος have the same force as the Latin participles in *-dus*, and denote duty or necessity, as δοτέος (*dandus*), *must be given*. The adjectives in -τεος, like the participle in *-dus*, has three genders, so as to agree with any noun that may be joined with it. They may also be used in the neuter in a general way, as signifying necessity: thus, ἀνὴρ λυτέος ἐστὶν (Lat. *vir solvendus est*), *the man must be set free*; τιμητέα ἐστὶν ἡ ἀρετή (Lat. *virtus honoranda est*), *virtue must be honoured*; γραπτέον ἐστὶν (Lat. *scribendum est*), *it is necessary to write*.

Both these adjectives are formed from the verbal stem. An easy practical way to form them is to change the termination of the first aorist passive, -θεις, into -τος or -τεος: as—

λύω,	λυθείς,	λυτός,	λυτέος.
τιμάω,	τιμηθείς,	τιμητός,	τιμητέος.

KEY TO EXERCISES.

Ex. 125.—1. Good men do not omit their duty through sleep. 2. Do not give up what is known and follow that which is unknown. 3. Many men desire wealth. 4. Xerxes is said to have let down fetters into the Hellespont, as if, forsooth, to punish it. 5. It is not easy to hold back a stone when you have let it go from your hand with force, or a word from your tongue. 6. Hercules, having pursued the boar of Erymanthus into a deep snow-drift with his shouting, ensnared him as he lay there. 7. The Nile empties itself into the sea by seven mouths. 8. Whatever shall come after, the gods provide for. 9. If you are (*since you are*) human, my good sir, be humanly minded. 10. While you are young, remember that you will some time be old. 11. Be just, that you may obtain justice. 12. When might is present, law has no power. 13. May I be happy and dear to the gods.

Ex. 126.—1. Ἴσθι. 2. Ἴτω. 3. Ὦ. 4. Εἴην. 5. Ἐφιέμενος. 6. Ἰών. 7. Ἔστων. 8. Ἰόντων. 9. Ἴθι. 10. Ἀγαθὸς ἴσθι. 11. Ἀγαθοὶ ἔστε. 12. Ἀγαθοὶ ἔστων. 13. Ἐξίημι. 14. Καθίης. 15. Προσῄεσαν. 16. Εἶμι. 17. Ἴασιν. 18. Ἤιεις. 19. Ἤιτην. 20. Ὁ ἀγαθὸς οὔποτε μεθήσει τὰ δέοντα πράττειν. 21. Πολλοὶ ἀφέντες τὰ φανερὰ διώκουσι τὰ ἀφανῆ. 22. Ξέρξης εἰς τὸν Ἑλλήσποντον πέδας κάθηκεν. 23. Οὐ διὰ τῆς γλώσσης ἀλλὰ δι' ἔργων ἄνθρωπος φίλος ἐμοὶ ἂν γένοιτο. 24. Δικαῖοι ἔστε ἵνα καὶ δικαίων τύχητε. 25. Φίλος φίλου καὶ ἀπόντος φροντίζει. 26. Ὅτε οἱ πολέμιοι εἰς τὴν πόλιν εἰσῄεσαν ἀπέφυγον οἱ πολῖται. 27. Ἄπιτε, ὦ παῖδες. 28. Δεῖ τοὺς στρατιώτας ἀπὸ τῆς πόλεως ἀπιέναι. 29. Δύο στρατεύματα εἰς τὴν ἡμετέραν πατρῴαν γῆν εἰσῄτην.

ELEMENTARY POLITICS.—V

[*Continued from p.* 312.]

EMPIRES (*continued*).

AUSTRIA was now a group of provinces containing very various races and with various systems of administration, mostly ruled almost despotically by an Emperor (so called). Germany, after the fall of Napoleon I., was reduced to a group of thirty-eight small States, governed despotically, in almost all cases, by their princes, but united in a sort of confederation. There was a strong feeling among the people that Germany ought to form one nation with one government. But the princes who would have been deposed by the change did not agree with this view. In 1848 there was an abortive attempt at union. In 1866, after the "Seven Weeks' War" with Austria, the Confederation was reconstituted as the North German Confederation under the leadership of Prussia, and after the Franco-German War of 1870–71, this Confederation (which had involved a *Zollverein* or Customs' Union between the constituent States) became the German Empire. The President is always the King of Prussia, who is called "German Emperor" (*not* Emperor of Germany, which would imply that the "eminent domain" and other rights of sovereignty vested in the Crowns of the constituent States had passed to him).

The Government of the Empire consists of the Emperor and his Ministers (who do not form a Cabinet) and a Legislature consisting of a Federal Council and a "Diet," or *Reichstag*. The members of the former are appointed by their respective Governments, and vote on instructions from them, Prussia appointing seventeen out of a total of fifty-eight; no other State has more than four, and most have only one. The Diet is elected in most cases practically by universal suffrage.

To this central Government the States have ceded various rights—including the right of coinage; of imposing customs duties and certain taxes; of administering the railway, postal, and telegraph service; of managing the army and navy; and of declaring war. But Bavaria and Saxony, and, in some degree, Würtemberg, retain their own army, and some of the States retain certain privileges as to taxation and other matters.

In short, the States are very unequal in size and privilege. All of them save two, Mecklenburg-Schwerin and Mecklenburg-Strelitz, have more or less of popular government.

Here then we have a Federal Monarchy, a Confederation which military necessities have drawn more closely together, and to which national sentiment has given a permanent hereditary head. (Should the royal family of Prussia ever be totally extinguished, that of Bavaria would according to the Constitution succeed to the Imperial dignity.) As a rule, moreover, the head of the Prussian Ministry has been head of the Imperial Ministry also; and, partly from Prussian tradition, partly from the personal character of the Emperors, the

Crown takes a far more active part than in most constitutional monarchies in the actual work of government. The immense benefits conferred on Germany by its unification—the common coinage, the freedom of trade and of settlement for any German within the limits of the Empire, the check to the despotism of the smaller princes—make it very improbable, apart from the existence of a strong national sentiment, that Germany will ever again be broken up as it was during the Middle Ages and the last century. But as to the predominance of Prussia, and of the influence of the Crown, permanently, it would hardly be safe to prophesy.

Up to 1860 the Austrian Empire was ruled by the Emperor almost despotically—though abortive attempts at revolution had been made in 1848. In that year, however, local Parliaments were established in most of the provinces of the Empire, and a *Reichsrath*, or Parliament of two Houses, established for the whole. The Upper House now consists of peers, archbishops, and bishops, members nominated by the Emperor, and certain high officials, and members of the Royal Family. Part of the Lower House is elected directly, the suffrage being widely extended but not universal. Part, however, is elected by the merchants of the large towns and part by the large landowners; so that there is direct class representation. Somewhat the same plan is carried out in the local Parliaments throughout Austria; but they consist of one Chamber only, and certain bishops and high officials have seats in right of their offices. Hungary from the first refused to send members to the Reichsrath; and after the defeat of Austria in 1866, it was found necessary to conciliate it by restoring its liberties. Accordingly, Hungary has a Parliament of its own, the Emperor of Austria being King of Hungary, and the two countries being united only for military purposes, foreign affairs, and, in part, finance. To deal with these a sort of consultative committee, the Delegations, is appointed from each legislature annually. A large party in Hungary, however, claims total administrative separation from Austria; another in Bohemia demands that that province shall be put on the same footing as Hungary; and the Italians, the Poles, and the various Slavonic races which make up the bulk of the population of the Austrian dominions all claim greater independence. It is therefore hardly to be expected that Austria can long remain as she is.

In these cases, we see that "Emperor" has meant a ruler over a group of rulers or governments. It is chiefly on this ground that the adoption of the title "Empress of India" by our Queen is defensible, Napoleon I. adopted the title partly from Roman traditions and partly because he aimed at being the supreme arbitrator of Europe; Napoleon III. followed his uncle. Elsewhere, as in Mexico and Hayti (occasionally), the title has merely been used as a grandiose equivalent for "King."

CHURCH AND STATE.

So far as the history of Europe is concerned, there can be no doubt that Church and State were originally simply two aspects of the same "body politic." The Church, it must be remembered, includes the laity as well as the clergy, just as the State includes the ordinary citizens as well as the Sovereign and its officers. Now the earlier States of Europe cannot be said ever to have established the Church. The doctrine had come down from Pagan times that every State was under the special patronage and protection of certain gods: to deny their existence or refuse to worship them was an act of rebellion; and the early Christians were persecuted, less as heretics than as rebels. To bring in a new God seemed to be overthrowing the foundations of society. Now when the Roman Empire was converted to Christianity, the ecclesiastical organisation tended to correspond in its subdivisions to the civil. The ecclesiastical "provinces" and dioceses corresponded to the civil provinces and their subdivisions. Indeed, we still speak of the province of an archbishop and the diocese of a bishop, because those terms were used in Roman civil administration, though of course, as the Roman Empire went to pieces and the Church grew, and multiplied its bishops, the correspondence soon came to an end. Similarly in England, the Anglo-Saxon bishoprics originally coincided in area with the Anglo-Saxon kingdoms. The bishops sat in the King's "Council of Wise Men" (which has grown into the House of Lords), not because they represented the Church, but because they were some of the most prominent people in the country. The clergy, like the nobles abroad or the Commons, formed an "estate of the realm" both in England and in the Continental kingdoms. Nor were either bishops or clergy in any way paid by the State. Lands were devoted to their support, either by the King—out of his personal domain—or by the nobles or private persons; or, more commonly, charges were laid on the land in perpetuity for religious purposes; but there was no formal "establishment" of the Church. Heretics were all but unknown, and when they appeared were treated rather as rebels against established authority than as offenders against religion. But the notion of two distinct bodies, Church and State, was promoted partly by the growth of the power of the Papacy and its constant conflicts with the kings of various European States; partly by the existence of the clergy as a separate class, marked off by celibacy, with privileges of their own, and a law of their own—Canon Law—administered by their own courts; and indirectly by those theories of Roman law which, applied to the kings of mediæval Europe, eventually aided the rise of absolute monarchy like that of Louis XIV. of France, which the Tudors and Stuarts tried unsuccessfully to establish in England. If the Sovereign was responsible only to God, it followed that it was his right and duty to control the religious beliefs and practices of his people. If he disagreed with the Pope (whose infallibility was then not an article of faith), it was his duty still to follow his own view. In Germany this was put concisely during the Reformation in the Latin maxim, *Cujus regio ejus religio* (*i.e.*, "He who has the country enforces on it his own religion"). States changed their faith as their rulers changed theirs. Moreover, Roman law had held that all corporations were subject in a special way to the State, which might dissolve them or alter the disposition of their property as it thought fit. The same power was claimed and exercised by Henry VIII.—for instance, in the dissolution of the monasteries; and even nominally Roman Catholic Sovereigns have often suppressed and disendowed the Jesuits in their country, or single monastic bodies. Again, the conflict between Episcopacy and Puritanism in England was not a conflict between two sects. It was a conflict between two parties in the Church as to what the discipline of the Church should be. That Nonconformists could exist side by side with the recognised forms of religion was an idea which grew up slowly, during the Commonwealth and even after the Restoration.

This notion that the Church is simply the nation organised for religious purposes is at the bottom of a good deal of the religious persecution we hear of in Russia. The Russian Government does not object to foreigners worshipping as they please. It does not much mind if its Tartar subjects are heathens or Mohammedans; it regards them as being so by nature. But it does object—mistakenly no doubt—to Dissent among its own subjects, because this seems anti-national and unpatriotic. Thus it tries to force the national religion on its Polish and German subjects, just as it tries to make them speak Russian instead of their own languages. Happily, in England we are far beyond this stage of civilisation. But four centuries ago the view would have seemed to our ancestors natural enough. However, the contract theory, which was used to explain the origin of the State, was likewise used in the eighteenth century to explain the relations of State and Church. The State, it was said, guarantees freedom and support to one (or possibly to several) religious bodies. It can thus control their excessive zeal if necessary, and secure the advantages of religious teaching. The Church, on its part, guarantees to obey and support the Government.

In many Continental countries this view has been acted on. In France at the Revolution Christian worship was formally abolished, and the property of the religious orders and the various religious corporations was confiscated. Then Napoleon I. re-established the Roman Church, making a formal agreement as to terms, or *Concordat*, with representatives of the Pope. The State pays the Catholic clergy (and the clergy of any sect which reaches 100,000 in number), and controls to some extent their appointment. Similar Concordats regulate the position of the Roman Church in other Continental States. But this contract theory easily passes into what is inaccurately known as Erastianism. Erastus was a Swiss of the sixteenth century, who, at a time when ecclesiastical synods exercised severe discipline, maintained that the power of punishment should belong to the civil authority only. Now the word is used to denote the theory that "the Established Church is a branch of the Civil Service." If the State pays the clergy, it may easily claim to direct them as to what they shall teach. The French clergy are often reminded that they are "State-paid officials," and for extreme interference in politics are punished by the suspension of their stipends.

Finally, the theory of Voluntaryism is held by many Liberals and almost all Nonconformists in England, and fully realised in the British colonies and the United States. According to this view, the State and the Church, or Churches, are wholly distinct. The State should have no more to do with the Churches than with any other association. If any association misuses its property, or interferes with the legal rights of its members or others, the State can and does interfere. Similarly, it interferes to regulate the application of the property, even of Nonconformist bodies, if the trusts on which the property is held are not observed. But farther than this the State should not go. The ideal to be aimed at is "a free Church"—or, rather, several free Churches—in a free State.

Disestablishment and Disendowment, in England, involve the replacement of the system implied in the first theory by the system implied in the fourth. The problem is immensely complicated by the fact that it is the first system we have to deal with, and not the second or third—that the Church is neither a body that has made terms with the State, nor a department of the Civil Service. As to creed, the Church of England is one body. As to property, it is not one body, but a great many. Each cathedral chapter, each diocese, each separate parish (or rather its parson), has its property separate from all the rest. Much of this, it is true, is under common management, and it is supplemented from certain common funds (which, however, do not legally belong to "the Church" as a body). Some of this property has belonged to these various owners for centuries; much has been recently given. There is no means of accurately distinguishing the new from the old, nor can anyone say at what date the line should be drawn. Of course, "the English Parliament is omnipotent": there is no law preventing its altering the disposition of corporate property, and there is plenty of precedent for its doing so. Much may be said on both sides, both from a religious and a political point of view. But it is important that we should see exactly what the problem is, and comprehend its immense difficulty, of which only the barest idea can here be given. We may refer those readers who desire a fuller statement to the late Professor Freeman's little book, "Disestablishment and Disendowment."

SPANISH.—XIV.

[*Continued from p. 304.*]

TABLE

Containing the Verbs that govern Certain Prepositions.

A.

Abalanzarse *á* los peligros,	to rush *on* dangers.
Abandonarse *á* la suerte	to abandon oneself *to* chance.
Abocarse *con* alguno,	to confer *with* anyone.
Abochornarse *de* algo,	to be chagrined *at* anything
Abogar *por* alguno,	to plead *for* anyone.
Abordar *á* una nave,	to board *a* ship.
Aborrecido *de* todos,	detested *by* all.
Abrasarse *en* deseos,	to be inflamed *with* desires.
Abundar *de* riquezas,	to abound *with* or *in* riches
Aburrido *de* las disgracias	weary *with* misfortunes.
Abusar *de* la amistad,	to abuse friendship.
Acabar *de* venir,	to be just come.
Acaecer *en* tal tiempo,	to happen *at* such a time
Acertar *á*, *con* la casa,	to find out or hit upon the house.
Acogerse *á* sagrado,	to take shelter *in* a church.
Acomodarse *á*, *con* otro dictámen,	to conform oneself *to* another opinion
Acompañarse *con* otros,	to keep company *with* others.
Aconsejarse *con*, *de* sabios,	to take counsel *with* wise men.
Acontecer *á* los incautos,	to happen *to* the unwary.
Acordarse *de* lo pasado,	to remember the past.
Acreditarse *de* necio,	to prove oneself a fool.
Acreditarse *con*, *para* alguno,	to get credit *with* one.
Actuarse *de*, *en* los negocios,	to acquaint oneself *with* business.
Adelantarse *á* otros,	to be in advance, or to take the lead, *of* others.
Adherirse *á* otro dictámen,	to adhere *to* another opinion.
Adolecer *de* alguna enfermedad,	to be ill *of* some disorder.
Aferrarse *en*, *con* su opinion,	to be fixed *in* one's own opinion.
Aficionarse *á*, *de* alguna cosa,	to be fond *of* anything.
Afirmarse *en* lo dicho,	to affirm what has been said.
Agraviarse *de* alguno,	to be affronted *with* anyone.
Ahitarse *de* manjares,	to surfeit oneself *with* food.
Ahorcajarse *en* las espaldas,	to get astride *upon* the back.
Ahorrar *de* razones,	to spare words.
No ahorrarse *con* ninguno,	not to spare anyone.
Airarse *con* alguno,	to be angry *with* anybody.
Ajustarse *á* la razon.	to be rightly inclined.
Ajustarse *con* alguno,	to make it up *with* anyone.
Alabarse *de* valiente,	to boast *of* bravery.
Alargarse *á* la ciudad,	to hasten *to* the city.
Alegrarse *de* algo,	to be rejoiced *at* anything.
Alejarse *de* su tierra,	to leave one's country
Alimentarse *de*, *con* yerbas,	to subsist *upon* herbs.
Alindar *con* otra heridad,	to be contiguous *to* another's estate.
Allanarse *á* la justo,	to submit *to* what is just.
Amancebarse *con* los libros,	to be fond *of* books.
Amañarse *á* escribir,	to be clever *in* writing.
Andar *con* el tiempo,	to accommodate oneself *to* time.
Andar *de* capa,	to walk *with* a cloak on.
Andar *en* pleitos,	to be litigious.
Andar *á* gatas,	to go *on* all fours.
Andar *por* tierra.	to be humbled *to* the dust.
Anhelar *á*, *por* mayor fortuna,	to wish for or covet better fortune.
Anticiparse *á* otro,	to anticipate another.
Aovar *en* la ribera,	to lay eggs *on* the seashore.
Aparar *en* la mano,	to receive *with* the hand.
Aparecerse *á* alguno,	to present oneself suddenly *before* anyone.
Aparecerse *en* el camino,	to present oneself suddenly *in* the road.
Aparejarse *para* el trabajo,	to prepare *for* work.
Apartarse *á* un lado,	to retire *on* one side.
Apasionarse *de*, *á*, *por* alguno,	to be enamoured *of* anyone.
Apearse *de* su opinion,	to change one's opinion.
Apechugar *con* alguna cosa,	to undertake anything with spirit.
Apechugar *por* los peligros,	to brave dangers.
Apedrear *con* las palabras,	to abuse anyone *with* words.
Apegarse *á* alguna cosa.	to adhere *to* anything.
Apelar *de* la sentencia,	to appeal *from* the sentence.
Apelar *á* otro medio,	to have recourse *to* another measure.
Apercibirse *de* armas,	to provide oneself *with* arms.
Apercibirse *á*, *para* la batalla,	to get ready *for* battle.
Apetecido *de*, *por* todos,	desired *by* all.
Apiadarse *de* los pobres,	to have compassion *on* the poor.
Aplicarse *á* los estudios,	to apply oneself *to* study.
Apoderarse *de* la hacienda,	to take possession *of* the property.
Apostar *á* correr,	to bet *on* a race.
Apresurarse *á* venir,	to make haste *to* come.
Apresurarse *por* alguna cosa,	to make haste *for* something.
Apretar *por* la cintura,	to take fast hold *by* the waist.
Aprobarse *en* alguna facultad,	to be approved *in* any faculty.
Aprobado *de* cirujano,	approved *as* a surgeon.
Apropriado *para* el oficio,	adapted *to* the office.
Apropriarse *á* él,	to appropriate to oneself.
Apropincuarse *á* alguno,	to approach anyone.
Aprovechar *en* la virtud,	to improve *in* virtue.
Aprovechar *de* la ocasion,	to seize the opportunity.
Apto *para* el empleo,	fit *for* the employment.
Apurado *de* medios,	exhausted *of* means.
Arder *en* deseos,	to burn *with* desires
Arderse *en* quimeras,	to be full *of* quarrels.
Arrebozarse *con* algo,	to muffle oneself up *in* anything.
Arrecirse *de* frio,	to be benumbed *with* cold.
Arreglarse *á* las leyes,	to conform *to* the laws.
Arregostarse *á* alguna cosa,	to be inclined *to* anything.
Arremeter *á*, *con*, *contra* el muro,	to assault the wall.
Arrestarse *á* todo,	to be enterprising *in* everything.
Arribar *á* tierra.	to reach land or the shore.
Arrimarse *á* la pared,	to lean *against* the wall.
Arrinconarse *en* casa,	to shut oneself up *at* home.
Arrogarse (algo) *á* si mismo,	to appropriate anything *to* oneself.
Arrojarse *á* pelear,	to rush on *to* fight.
Arroparse *con* la capa,	to cover oneself *with* a cloak.
Arrostrar *á*, *con* los peligros,	to face dangers.
Asarse *de* calor,	to be scorched *with* heat.
Ascender *á* otro empleo,	to rise *to* another office.

Asegurarse *de* su contrario,	to shelter oneself *from* one's enemy.
Asesorarse *con* letrados,	to seek counsel *of* learned men.
Asistir *á* los enfermos,	to assist the sick.
Asistir *en* tal casa,	to attend such a house.
Asomarse *á*, *por* la ventana,	to look out *of* the window.
Asparse *á* gritos,	to be exhausted *with* clamourings.
Asparse *por* alguna cosa,	to torment oneself *for* anything.
Atarse *á* una sola cosa,	to tie oneself *to* one thing alone.
Atemorizarse *de*, *por* algo,	to be afraid *of* something.
Atenerse *á* lo seguro,	to keep *on* the safe side.
Atento *con* sus mayores,	respectful *to* one's superiors.
Atollarse *en* los caminos,	to stick fast *in* the road.
Atreverse *á* cosas grandes,	to animate oneself *to* great things.
Atreverse *con* todos,	to dare everybody.
Atribularse *en*, *con* los trabajos,	to be afflicted *with* labour or troubles.
Atropellarse *en* las acciones,	to overhasten actions,
Atufarse *en* la conversacion,	to take offence *in* conversation.
Atufarse *por* poco,	to be affronted *at* a trifle.
Avecindarse *en* algun pueblo,	to take up one's abode *in* any town.
Avenirse *con* todos,	to agree *with* everybody.
Aventajarse *á* otros,	to gain the advantage *over* others.
Avergonzarse *á* pedir,	to be ashamed *of* asking.
Avergonzarse *de* algo,	to be ashamed *of* anything.
Averiguarse *con* alguno,	to agree *with* anyone.
Aviarse *de* ropa,	to furnish oneself *with* clothes.
Avocar alguna cosa *á* si,	to call a cause from an inferior court to one's own.

B.

Balancear *á* tal parte,	to vibrate *on* such a side.
Balancear *á* la duda,	to fluctuate *in* doubt.
Balar *por* dinero,	to clamour *for* money.
Bambolear *en* la maroma,	to dance *on* the rope.
Bañarse *en* agua,	to bathe oneself *in* water.
Barar *en* tierra,	to run aground.
Barbear *con* la pared,	to reach a wall *with* one's chin.
Bastardear *de* su naturaliza,	to degenerate *from* his nature.
Bastardear *en* sus acciones,	to be degenerate *in* one's actions.
Batallar *con* los enemigos,	to fight *with* the enemy.
Bajar *á* la cueva,	to go down *to* the cellar.
Bajar *de* la torre,	to descend *from* the tower.
Bajar *hacia* el valle,	to descend *towards* the valley.
Blasfemar *de* la virtud,	to blaspheme *against* virtue.
Blasonar *de* valiente,	to boast *of* bravery.
Bordar (algo) *de*, *con* plata,	to embroider anything *in* or *with* silver.
Bordar *de* pasados,	to embroider *with* the needle.
Bordar (algo) *al* tambor,	to embroider on a tambour frame.
Bostezar *de* hambre,	to gape with hunger.
Bramar de corage,	to roar *with* anger.
Brear *á* chaseo,	to vex *with* tricks.
Bregar *con* alguno,	to struggle *with* anyone.
Brindar *con* regulos,	to offer presents.
Brindar *á* la salud de alguno,	to drink *to* anyone's health.
Bufar *de* ira,	to swell *with* anger.
Bullir *en*, *por* todas partes,	to move *in* all parts.
Burlarse *de* algo,	to make a jest of anything.

C.

Caber *de* piés,	to be able to stand *on* one's feet.
Caber *en* la mano,	to be contained *in* the hand.
Caer *á*, *hacia* tal parte,	to fall *on* such a side.
Caer *de* lo alto,	to fall *from* on high.
Caer *en* tierra, *en* cuenta, *en* error, *en* tal tiempo, *en* lo que se dice.	to fall *upon* the earth, to comprehend, to fall *into* error, to fall out *at* such a time, to understand what is said.
Caer *por* Pascua.	to fall *at* Easter.
Caer *sobre* los enemigos,	to fall *upon* the enemy.
Calarse *de* agua,	to wet oneself through *with* water.
Calentarse *á* la lumbre,	to warm oneself *at* the fire.
Calificar *de* docto,	to qualify anyone *as* a learned man.
Callar la verdad *á* otro,	to conceal the truth *from* another.
Callar *de*, *por* miedo,	to be silent *from* fear.
Calumniar á alguno *de* injusto,	to calumniate anyone *as* unjust.
Calzarse *á* alguno,	to lead anyone *by* the nose.
Cambiar alguna cosa *por* otra,	to exchange one thing *for* another.
Caminar *á* pie.	to travel *on* foot.
Caminar *por* el monte,	to walk *along* the mountain.
Cansarse *de*, *con* el trabajo,	to fatigue oneself *with* work.
Cansarse *de* pretender,	to be tired *of* pretending.
Cansarse *en* el camino,	to be tired *on* the road.
Capaz *de* cien arrobas,	capable *of* holding a hundred arrobas.
Capaz *de*, *por* el empleo,	capable *for* the post.
Capitular a alguno *de* mal juez,	to reproach anyone *as* a bad judge.
Cargarse *de* razon,	to insist *upon* one's opinion.
Casar una persona (ó cosa) *con* otra.	to couple one person (or thing) *with* another.
Categuizar á alguno *para* alguna cosa,	to persuade anyone *to* anything.
Cautivar, á alguno *con*, *por* beneficios,	to overcome anyone *with* favours.
Cazcalear *de* una parte *á* otra,	to go lounging about.
Ceder *en* beneficio de alguno,	to resign *in* another's favour.
Censurar *de* mala,	to blame (anything) *as* bad.
Ceñirse *á* lo posible,	to keep *within* bounds.
Chancearse *con* alguno,	to joke *with* anyone.
Chapuzar algo *en* el agua,	to sink anything *in* the water.
Chocar *á* alguno,	to provoke anyone.
Chocar *con* otro,	to strike one *against* the other.
Clamar *á* Dios,	to call *upon* God.
Clamorear *por* los muertos,	to ring a peal *for* the dead.
Coartar la facultad *á* alguno,	to restrict anyone's powers.
Cobrar dinero *de* los deudores,	to receive money *from* debtors.
Colegir *de*, *por* los antecedentes.	to infer *from* the antecedents.
Coligarse *con* alguno,	to make an alliance *with* anyone.
Columpiarse *en* el aire,	to swing *in* the air.
Comedirse *en* las palabras,	to be civil *in* words.
Comenzar *á* decir,	to begin *to* say.
Comerse *de* envidia,	to pine *with* envy.
Competir *con* alguno,	to vie *with* anyone.
Complacerse *de*, *en* alguna cosa,	to be pleased *with* anything.
Componerse *con* los deudores,	to compound *with* debtors.
Componerse *de* bueno y malo,	to be made *of* good and bad.
Comprometerse *con* alguno,	to render oneself answerable *to* anyone.
Comprometerse *en* jueces arbitros,	to compromise *by* arbitration.
Comunicar (luz) *á* alguna parte,	to communicate (light) *to* any part.
Comunicar (uno) *con* otro,	to commune one *with* another.
Concebir (alguna cosa) *en* el animo,	to comprehend or conceive something.
Concebir una cosa *por* buena,	to conceive anything *as* good.
Conceptuar á alguno *de*, *por* sabio,	to look upon anyone *as* a wise man.
Concertar una cosa *con* otra,	to concert one thing *with* another.
Concordar la copia *con* el original,	to make the copy agree *with* the original.
Concurrir *á* alguna parte,	to meet *at* some place.
Concurrir *con* otros,	to agree *with* others.
Concurrir *en* un dictámen.	to agree *in* one opinion.
Condenar á uno *en* las costas,	to condemn one *in* costs.
Condolerse *de* los trabajos,	to be grieved *with* the trouble.
Confederarse *con* alguno,	to ally oneself *with* anyone.
Conferir en negocio *entre* los amigos,	to confer on business *with* friends.
Confesarse *con* alguno,	to acknowledge *to* anyone.
Confesarse *de* sus culpas,	to confess one's sins.
Confiar *en*, *de* alguno,	to rely *upon* anyone.
Confinar *con*,	to be adjacent *to* (speaking of countries).
Confirmarse *en* su dictámen,	to be confirmed *in* one's opinion.
Conformarse *con* el tiempo,	to conform *to* the times.
Confundirse *de* lo que se ve,	to be confounded *with* what one sees.
Confundirse *en* sus juicios,	to be thrown (one's senses) into confusion.

Congeniar *con* alguno,	to be congenial *to* anyone.
Congeturar algo *de*, *por* señales,	to conjecture anything by signs.
Congraciarse *con* alguno,	to ingratiate oneself *with* anybody.
Congratularse *de* alguna cosa,	to rejoice *in* or *at* anything.
Conmutar algo *con* otra cosa,	to barter one thing *for* another.
Consentir *en* algo,	to agree *to* anything.
Conspirar *en* un intento,	to enter *into* a conspiracy.
Constar *por* escrito,	to state *in* writing.
Contaminarse *de* heregias,	to contaminate oneself *with* heresies.
Contenerse *en* su obligacion,	to hold *to* one's contract.
Contrapesar una cosa *con* otra,	to weigh one thing *against* or *with* another.
Contravenir *á* la ley,	to transgress *against* the law.
Contribuir *con* dinero,	to contribute money.
Convencerse *de* la razon,	to be convinced by reason.
Convenir *en* alguna cosa,	to agree *upon* anything.
Conversar *en* materias de estado,	to converse *upon* affairs of state.
Convidar á alguno *con* dinero,	to offer money *to* anybody.
Convocar *á* junta,	to convene a meeting.
Cooperar *á* alguna cosa,	to co-operate *in* anything.
Correrse *de* vergüenza,	to be ashamed.
Corresponder *á* los beneficios,	to be grateful *for* benefits.
Cotejar la copia *con* el original,	to compare the copy *with* the original.
Cuadrar *con* el encargo,	to fit *for* the employment.
Cuadrar *á* alguno,	to fit anyone.
Culpar *á* uno de omiso,	to blame anyone for negligence.
Cumplir *con* alguno,	to discharge one's obligation *to* anybody.
Cumplir *con* su obligacion,	to perform one's duty.
Curarse *en* salud,	to take care *of* one's health.
Curtirse *al* aire,	to tan *by* the air.
Curtido *del* sol,	tanned by the sun.

D.

Dar á alguno *de* palos,	to beat anyone with a stick.
Dar *de* blanco,	to hit the mark.
Dar *en* manias,	to be foolish, whimsical,
Dar *por* visto,	to suppose anything *as* seen.
Darse *por* vencido,	to acknowledge oneself *as* conquered.
Decaer *de* su autoridad,	to fall *from* one's authority.
Dedicar su tiempo *al* estudio,	to employ one's time *in* study.
Dejar *de* escribir,	to leave *off* writing.
Delatarse *al* juez,	to accuse oneself *before* a judge.
Depender *de* alguno,	to depend *upon* anybody.
Derrengar *de* alguna cosa,	to detest anything.
Desabrócharse *con* alguno,	to divulge one's secret to another.
Desagradecido *á* algun beneficio,	ungrateful *for* any benefit.
Desahógarse con alguno *de* su pena,	to impart one's trouble to another.
Desapropiarse *de* algo,	to alienate anything.
Descabezarse *en*, *con* alguna cosa,	to labour hard *on* anything.
Descalabazarse *en* alguna cosa,	to puzzle one's brains to find out something.
Descansar *de* la fatiga,	to rest *from* fatigue.
Descollar *sobre* otros,	to surpass others.
Desconfiar *de* alguno,	to mistrust anyone.
Descubrirse *con* alguno,	to disclose oneself *to* anyone.
Descuidarse *de* su obligacion,	to neglect one's duty.
Desdecir *de* su carácter,	to deviate *from* one's character.
Desdecir *de* lo dicho,	to retract what one has said.
Desdeñarse *de* alguna cosa,	to disdain anything.
Desenfrénarse *en* vicios,	to abandon oneself *to* vices.
Desertar *de* las banderas,	to desert the standard.
Deshacerse *en* llanto,	to burst *into* tears.
Desmentir *á* alguno,	to give anyone the lie.
Despertar *á* alguno,	to awake anyone.
Despertar *del* sueño,	to awake *from* sleep.
Despoblarse *de* gente,	to become depopulated.
Desquitarse *de* la perdida,	to make up *for* one's loss.
Destrizarse *á* llorar,	to consume oneself *with* weeping.
Destrizarse *de* enfado,	to consume oneself *with* anger.
Desviarse *del* camino,	to lose one's way.
Desvivirse *por* algo,	to be anxious *for* something.
Detenerse *en* dificultades,	to be stopped *by* difficulties.
Dignarse *de* conceder algo,	to condescend *to* grant anything.
Disgustarse *de* una cosa,	to be disgusted *with* anything.
Disponer *de* los bienes,	to dispose *of* goods.
Disponerse *á* caminar,	to prepare oneself *for* travel.
Disputar *de*, *sobre* una cosa,	to dispute *on* or *about* anything.
Disentir *de* otro dictámen,	to dissent *from* another's opinion.
Disuadir á alguno *de* alguna cosa,	to dissuade anyone *from* anything.
Dividir *por* mitad,	to divide *into* halves.
Dotado *de* ciencia,	endowed *with* learning.
Dudar *de* alguna cosa,	to doubt anything.
Durar *por* mucho tiempo,	to last a long time.

E.

Echar algo *en*, *por* tierra,	to throw anything *on* the earth.
Embobarse *con*, *de*, *en* alguna cosa,	to be stupefied *with* anything.
Emboscarse *en* el monte,	to be in ambush *on* a hill.
Embutir *de* algodon,	to line *with* cotton.
Emendarse *con* la correccion,	to be amended *by* correction.
Empaparse *en* agua,	to be soaked *with* water.
Emparejar *con* alguno,	to put one on a level *with* anyone.
Emparentar *con* alguno,	to be related *to* anyone.
Empeñarse *en* una cosa,	to pledge oneself *to* a thing.
Empeñarse *por* alguno,	to take part *for* another.
Emplearse *de* alguna cosa,	to employ oneself *about* a thing
Enagenarse *de* alguna cosa,	to alienate anything.
Enamorarse *de* alguno,	to be enamoured *with* anyone.
Enamoricarse *de* alguno,	to fall in love *with* anyone.
Encallar una nave *en* arena,	to run a ship *on* the sand.
Encaramarse *en*, *por*, *sobre* la pared,	to climb *up* the wall.
Encararse *á*, *con* alguno,	to face another.
Encagarse *de* algun negocio,	to undertake any business.
Encasquetarse algo *en* la cabeza,	to be obstinate in maintaining anything.
Encenagarse *en* vicios,	to become vicious.
Encenderse *en* ira,	to kindle *with* anger.
Enconarse *con* alguno,	to be irritated *against* anyone.
Enfermar *del* pecho,	to have a pain *in* the breast.
Engreirse *con* la fortuna,	to become vain *with* fortune.
Enlazar alguna cosa *con* otra,	to tie one thing *to* another.
Ensayarse *á*, *para* alguna cosa,	to try to do anything.
Ensayarse *con* alguna cosa,	to become expert in anything.
Entender *de* alguna cosa,	to understand anything.
Entender *en* sus negocios,	to understand one's business.
Enterarse *en* algun negocio,	to be well acquainted *with* any business.
Entrar *en* alguna parte,	to enter any place.
Entremeterse *en* cosas de otro,	to meddle *with* another's affairs.
Equivocarse una cosa *con* otra,	to mistake one thing *for* another.
Equivocarse *en* algo,	to be mistaken *in* anything.
Escaparse *por* la ventana,	to escape *through* the window.
Escarmentar *de*, *con* alguna cosa,	to take warning *at* anything.
Escaso *de* medios,	limited, or scanty, *in* means.
Esceder *á* otra cosa,	to excel another thing.
Esceder *en* mil reales,	to exceed *by* a thousand reals.
Escusarse *con* alguno,	to excuse oneself *to* anyone.
Estampar *en* papel,	to stamp *on* paper.
Estar *á* la órden de otro,	to be *under* another's orders.
Estar *de* viaje,	to be *on* a journey.
Estar *en* animo de,	to have a mind to.
Estar *en* lo que hace,	to know what is doing.
Estar *para* salir,	to be going out.
Estar *por* alguno,	to be in favour of anyone.
Estar *por* suceder,	to be near happening.

F.

Facil *de* digerir,	easy of digestion, or *to* digest.
Faltar *á* la palabra,	to break one's word.
Faltar *de* alguna parte,	to be missing *from* somewhere.
Falto *de* juicio,	wanting *in* judgment.
Fastidiarse *de* manjares,	to be disgusted *with* food.
Favorecerse *de* alguno,	to avail oneself *of* anyone.
Fijar *en* la pared,	to fix *on* the wall.
Fuerte *de* condicion,	in high condition.

G.

Girar *á* cargo de otro,	to draw a bill *upon* another.
Girar *de* una parte á otra,	to reel *from* one side to another.
Girar *por* tal parte,	to turn *to* such a side.
Gozar *de* alguna cosa,	to relish anything.
Graduar una cosa *por, de* buena,	to pronounce anything *as* good.
Grangear *á, de* alguno,	to gain the affection *of* anyone.
Gustar *de* alguna cosa,	to like anything.

H.

Hablar *en* Griego,	to talk gibberish or Greek.
Hacer *á* todo,	to be handy *at* anything.
Hacer *de* valiente,	to pretend *to* courage.
Hartarse *de* comida,	to satiate oneself *with* food
Henchir *de* agua,	to fill *with* water.
Hervir *en, de* gente,	to swarm *with* people.
Hincarse *de* rodillas,	to kneel down.
Hocicar *en* alguna cosa,	to stumble *on* anything.
Holgarse *de, con* alguna cosa,	to rejoice *at* anything.
Humanarse *con* los inferiores,	to condescend *to* inferiors.

I.

Idoneo *para* alguna cosa,	fit *for* anything.
Imbuir *de, en,*	to imbue *with.*
Impelido *de* la necesidad,	impelled *by* necessity.
Imponer una pena *á* alguno,	to impose a penalty *upon* anyone.
Imprimir *en* el animo,	to imprint *on* the soul.
Impropio *de, en, para* su edad,	unbecoming his age.
Inapelable *de* su opinion,	obstinate *in* one's opinion.
Incidir *en* culpa,	to fall again *into* a fault.
Incumbir *á* alguno,	to be incumbent *upon* anyone.
Inductivo *de* error,	leading *to* error.
Indultar *de* la pena,	to remit the punishment.
Infecto *de* heregias,	tainted *with* heresies.
Inficionado *de* peste,	infected *with* the plague.
Influir *en* alguna cosa,	to have influence *in* any matter.
Ingrato *á* los beneficios,	ungrateful *for* benefits.
Ingrato *con* los amigos,	ungrateful *to* friends.
Insinuarse *con* los poderosos,	to insinuate oneself *with* the great.
Inspirar *á* alguno,	to inspire anyone.
Internarse *con* alguno,	to creep *into* another's favour.
Introducirse *con* los que mandan,	to introduce oneself *to* those who command.
Ingerir un árbol *en* otro,	to graft one tree *on* another.
Ir *por* el camino,	to go *in* the road.

L.

Lamentarse *de* la disgracia,	to lament the misfortune.
Lastimarse *con, en* una piedra,	to hurt oneself *against* a stone.
Lastimarse *de* alguno,	to take pity on anyone.
Leer los pensamientos *á* alguno.	to read anyone's thoughts.
Limitar las facultades *á* alguno,	to limit anyone's powers.
Lindar *con,*	to be adjoining *to.*
Llevarse de alguna pasion,	to be carried away *by* some passion.
Ludir una cosa *con* otra,	to rub one thing *against* another.

M.

Malquistarse *con* alguno,	to make oneself hated *by* anyone.
Manar agua *de* una fuente,	to bring water *from* a fountain.
Manco *de* una mano,	Maimed *of* one hand.
Mantener conversacion *á* alguno,	to keep up conversation *with* anyone.
Mantenerse *de* yerbas,	to live *upon* herbs.
Maquinar *en, sobre,* alguna cosa,	to contrive anything.
Maravillarse *de* alguna cosa,	to wonder *at* anything.
Mas *de* cien ducados,	more *than* a hundred ducats.
Matarse *en* trabajar,	to kill oneself *with* labour.
Matarse *por* conseguir,	to kill oneself *to* obtain.
Medirse *con* sus fuerzas,	to act according to one's abilities.
Medirse *en* las palabras,	to weigh one's words.
Mejorar *de* empleo,	to better one's employment.
Meter *en* empeño,	to put *under* the necessity.
Meterse *á* caballero,	to affect the character and dignity of a gentleman.
Meterse *en* los peligros,	to expose oneself *to* dangers.
Mirar *á* oriente,	to face the east.
Mirar *por* alguno,	to look *for* anyone's interest.
Molerse *á* trabajar,	to tire oneself *with* working.
Molido *de* andar,	fatigued *with* walking.
Montar *á* caballo,	to mount *on* horseback.
Montar *en* mula,	to mount a mule.
Montar *en* colera,	to get *into* a passion.
Morir *de* poca edad,	to die *at* an early age.
Morirse *de* frio,	to be dying *with* cold.
Morirse *por* lograr alguna cosa,	to long *to* obtain anything.
Motejar *de* ignorante,	to stigmatise *as* ignorant.
Motivar *con* razones,	to justify *by* reasons.
Mudar *de* intento,	to change one's mind.
Mudarse *de* casa,	to remove *from* a house.
Murmurar *de* alguno,	to murmur *against* anyone.

N.

Nacer *con* fortuna,	to be born *to* fortune.
Nacer *en* las malvas,	to be born *of* low parentage.
Nacer *para* trabajos,	to be born *to* labour or trouble.
Negarse *á* la comunicacion,	to deny oneself *to* company.
Nombrar *para* el empleo,	to nominate *to* the post.
Notar *de* hablador,	to censure *as* a talker.
Nimio *en* su proceder,	over-nice *in* one's conduct.
Nivelarse *á* lo justo,	to conform *to* what is just.

O

Obstar *á* una cosa,	to hinder a thing.
Ocuparse *en* trabajar,	to be occupied *with* work.
Ofenderse *de, con* alguna cosa,	to be offended *at* anything.
Oler *á* otra cosa,	to smell *of* something else.
Olvidarse *de* lo pasado	to forget the past.
Oprimir *con* el poder,	to oppress *by* power.
Ordenarse *de* sacerdote,	to be ordained *as* a priest.
Orillar *á* alguna parte,	to draw *near* to any place.

P.

Pagarse *de* buenas razones,	to be satisfied *with* good reasons.
Palmear *á* alguno,	to clap anybody.
Parar *en* casa,	to stay *at* home.
Pararse *á* descansar,	to stop *to* rest oneself.
Pararse *con* alguno,	to stop *with* anyone.
Parecer *en* alguna parte,	to appear anywhere.
Parecerse *á* otro,	to resemble another.
Partir *á* Italia,	to set off *to* Italy.
Partir *por* mitad,	to divide *in* halves.
Pasar *á* Madrid,	to go *to* Madrid.
Pasar *de* Sevilla,	to go *beyond* Seville.
Pasarse *de* la memoria,	to slip one's memory.
Pasarse *de* madura,	to be over-ripe.
Pasarse *de* letras,	to become a scholar.
Pasearse *por* el campo,	to take a walk *in* the country.
Pecar *contra* la ley,	to transgress the law.
Pecar *de* ignorante,	to sin *through* ignorance.
Pecar *en* alguna cosa,	to be faulty *in* anything.
Pecar *por* demasia,	to sin *through* excess.
Pedir alguna cosa *á* alguno,	to ask something *of* anyone.
Pedir *de* justicia,	to claim *in* or sue *at* law.
Pegar *contra, en* la pared,	to fasten *against* or *to* the wall.
Pelarse *por* algo,	to be anxious *for* something.
Pender *de* alguna cosa,	to depend *upon* anything.
Penetrado *de* dolor,	penetrated *with* grief.
Pensar *en* alguna cosa,	to think *of* anything.
Perder *de* vista,	to lose sight *of.*
Perderse *en* el camino,	to lose one's way.
Perecer *de* hambre,	to perish *with* hunger.
Perecerse *de* risa,	to die *with* laughing.
Peregrinar *por* el mundo,	to wander *through* the world.
Perseguido *por* enemigos,	pursued by enemies.
Persuadir *á* alguno,	to persuade anyone.
Persuadirse *á* algo,	to be persuaded *of* something.
Persuadirse *de, por* las razones de otro,	to be persuaded *by* another's reasons.
Pertrecharse *de* lo necesario,	to provide oneself *with* necessaries.
Picarse *de* alguna cosa,	to pique oneself *on* anything.
Pintipirado *á* alguno,	exactly like anyone.
Plagarse *de* granos,	to be tormented *by* pimples.
Poblar *de* árboles,	to fill *with* trees.
Poblarse *de* gente,	to be peopled *by* persons.
Ponderar *de* grande,	to exaggerate.

Poner *á* oficio,	to put *in* business.
Poner *en* alguna parte,	to put somewhere.
Poner *por* corregidor,	to appoint *as* corregidor.
Poseido *de* temor,	possessed *by* fear.
Postrado *de* la enfermedad,	prostrated *by* sickness.
Postrarse *en* cama,	to be confined *to* one's bed.
Postrarse *en* tierra,	to kneel down *on* the ground.
Precedido *de* otro,	preceded *by* another.
Preciarse *de* valiente,	to pique oneself *on* courage.
Preferido *de* alguno,	preferred *by* anyone.
Preguntar *á* alguno,	to ask anyone.
Prendarse *de* alguno,	to be taken *with* anyone.
Prender *en* la tierra,	to take root *in* the earth.
Preocuparse *de* alguna cosa,	to be preoccupied *by* anything
Prescindir *de* alguna cosa,	to lay aside anything.
Presidir *á* otros,	to preside *over* others.
Presidir *en* un tribunal,	to preside *in* a tribunal.
Prestar *para* la salud,	to contribute *to* health.
Presumir *de* docto,	to set up *for* a man of learning
Prevenirse *de* lo necesario,	to provide oneself *with* necessaries.
Pringarse *en* alguna cosa,	to intermeddle *in* anything.
Privar *con* alguno,	to be intimate *with* anyone.
Proximo *a* morir,	at the point of death.

Q.

Quebrantar los huesos *á* alguno	to break anyone's bones.
Quebrar el corazon *á* alguno,	to break anyone's heart.
Quedar *de* asiento,	to remain *in* a place.
Quedar *de* piés,	to remain standing.
Quedar *en* casa,	to remain *at* home.
Quedar *por* andar,	to have *to* proceed further.
Quedar *por* alguno,	to be bail *for* anyone.
Quedar *por* cobarde,	to be reputed a coward.
Quedar *por* mia,	to fall *to* my share.
Quedarse *en* el sermon,	to stop short *in* a discourse.
Querellarse *á*, *ante* el juez,	to lay one's complaint *before* the judge.
Querellarse *de* su vecino,	to complain *of* one's neighbour.
Quemar *con* malas razones,	to inflame one with invective.
Quemarse *de* alguna palabra,	to be offended *at* any word.
Querido *de* sus amigos,	beloved *by* one's friends.
Quitar *á* alguno,	to take *from* anyone.
Quitar *de* alguna parte,	to take *from* any place.
Quitarse *de* quimeras,	to rid oneself *of* whims.

R.

Rabiar *de* hambre,	to be very hungry.
Rabiar *por* comer,	to long *to* eat.
Radicarse *en* la virtud,	to be fixed *in* virtue.
Raer *de* alguna cosa,	to scrape *from* anything.
Rayar *con* la virtud,	to excel *in* virtue.
Recalcarse *en* lo dicho	to be firm *in* what has been said.
Recatarse *de* alguno,	to be cautious *with* anyone
Recibir *á* cuenta,	to receive *on* account.
Recibir *en* casa,	to receive *at* home.
Recibirse *de* abogado,	to be admitted *as* a counsellor.
Recudir *á* alguno con el sueldo,	to pay anyone his wages.
Redondearse *de* deudas,	to pay off one's debts.
Redondar *en* beneficio,	to conduce *to* the benefit.
Reirse *á* carcajadas,	to laugh heartily.
Reirse *de* alguno,	to laugh *at* anyone.
Renegar *de* alguna cosa,	to apostatise *from* anything
Resbalarse *de* las manos,	to slip away *from* the hands.
Resentirse *de* alguna cosa,	to resent anything.
Residir *de* asiento en alguna parte,	to be settled *in* any place.
Residir *en* la corte,	to reside *at* court.
Resolverse *á* alguna cosa,	to resolve *upon* anything.
Responder *á* la pregunta,	to answer the question.
Restituirse *á* su casa,	to return *to* one's house.
Retirarse *á* la soledad,	to retire *into* solitude.
Retraerse *á* alguna parte,	to take refuge anywhere.
Reventar *de* risa,	to burst *with* laughter.
Reventar *por* hablar,	to burst *with* a desire to speak.
Revestirse *de* autoridad,	to be invested *with* authority.
Robar dinero *á* alguno,	to rob anyone *of* money.
Rodar *por* tierra,	to upset.
Rodear *por* todas partes,	to encompass *on* all sides.
Rogar alguna cosa *á* alguno,	to beg anything *of* anyone.
Romper *por* alguna parte,	to break *in* any place.
Rozarse una cosa *con* otra,	to rub one thing *against* another.

S.

Saber *á* vino.	to taste *like* wine.
Saber *de* trabajos,	to be acquainted *with* trouble.
Sacar *á* la plaza,	to take *to* the market.
Sacar *de* alguna parte,	to take *from* any place.
Sacar *en* limpio,	to copy fair, or clear up doubts.
Salir *á* alguna cosa,	to co-operate *in* anything.
Salir *con* la pretension,	to attain one's aim.
Salir *por* fiador,	to appear *as* security.
Saltar *á* la imaginacion,	to strike the imagination.
Saltar *de* gozo,	to leap *with* joy.
Saltar *en* tierra,	to leap *on* the ground, *on* shore.
Sentarse *en* la mesa,	to sit down *to* table.
Sentarse *a* la silla,	to sit down *in* the chair.
Servir *de* mayordomo,	to serve *as* a steward.
Servir *en* palacio,	to be a servant *in* a palace.
Sincerarse *de* alguna cosa,	to clear oneself *from* something.
Sitiado *de* enemigos,	besieged *by* enemies.
Sitiar *por* hambre,	to starve out.
Sobresaltarse *de* alguna cosa,	to be startled *at* anything.
Sojuzgado *de* enemigos,	subdued *by* enemies.
Sonar *á* hueca,	to sound hollow.
Sordo *á* las voces,	deaf *to* the cries.
Sospechoso *á* alguno,	suspected *by* anyone.
Subsistir *del* auxilio ageno,	to subsist *by* others' aid.
Sustraerse *de* la obediencia,	to withdraw *from* one's obedience.
Supeditado *de* los contrarios,	subdued *by* the enemies.
Suplicar *de* la sentencia,	to petition *against* the sentence.
Surgir *en* el puerto,	to ride at anchor *in* the port.
Surtir *de* viveres,	to supply *with* victuals.
Suspenso *de* oficio,	suspended *from* office.
Suspirar *por* el mando,	to aspire *after* command.
Sustentarse *con* yerbas,	to support oneself *on* herbs.
Sustentarse *de* esperanzas,	to sustain oneself *with* hopes.

T.

Tachar á alguno *de* ligero,	to accuse anyone *of* levity.
Temblar *de* frio,	to tremble *with* cold.
Temido *de* muchos,	feared *by* many.
Temible *á* los contrarios	dreaded *by* his enemies.
Templarse *en* comer,	to be temperate *in* eating.
Tenerse *en* pié,	to remain *on* foot or standing.
Teñir *de* azul,	to dye blue.
Tirar *por* tal part	to draw *towards* such a side.
Tiritar *de* frio,	to shiver *with* cold.
Tocar *á* alguno,	to fall *to* anyone.
Tocar *en* alguna parte,	to touch *in* any place.
Tocado *de* enfermedad,	touched *with* disease.
Tomar *de* tal modo,	to take *in* such a manner.
Torcido *de* cuerpo,	deformed *in* body.
Trabar *de* alguno,	to seize *on* anyone.
Trabar una cosa *con* otra,	to join one thing *with* another.
Trabar *en* alguna cosa,	to fall *upon* anything.
Trabarse *de* palabras,	to engage *in* words.
Trabucarse *en* las palabras,	to be confused *in* one's words.
Transitar *por* alguna parte,	to pass *by* any place.
Transpirar *por* todas partes,	to transpire *on* all sides.
Traspasado *de* dolor,	pierced *with* grief.
Tratar *en* lanas,	to deal *in* wool.
Triunfar *de* los enemigos,	to triumph *over* the enemy.
Tropezar *en* alguna cosa	to stumble *on* anything.

U

Utilizarse *en*, *con* alguna cosa,	to draw advantage *from* anything.

V.

Vacar *al* estudio,	to attend *to* study.
Vaciarse *de* alguna cosa,	to be emptied *of* anything.
Vaciarse *por* la boca,	to be open-mouthed.
Vacilar *en* la eleccion,	to hesitate *in* one's choice.
Vacuo *de* entendimiento,	empty-headed.
Vagar *por* el mundo,	to wander *through* the world.
Valuar *en* tal precio,	to value *at* such a price.
Vanagloriarse *de* alguna cosa,	to be puffed up with pride *about* anything.
Vecino *al* trono,	near the throne.
Vecino *de* Antonio,	a neighbour *of* Anthony's.

Velar *á* los muertos,	to watch *by* the dead.
Vencerse *á* alguna cosa,	to conquer oneself *in* anything.
Vencido *de* los enemigos,	conquered *by* the enemy.
Vengarse *de* otro,	to revenge oneself *on* another.
Verse *con* alguno,	to meet anyone.
Verse *en* altura,	to find oneself *in* such a latitude or high station.
Vestir *á* la moda,	to dress *in* the fashion.
Vestirse *de* paño,	to be dressed *in* cloth.
Violentarse *en* alguna cosa,	to be violent *in* anything.
Vivir *de* limosna,	to live *by* alms.
Vivir *por* milagro,	to live *by* a miracle.
Vivir *sobre* la haz de la tierra,	to live *without* care.
Volar *por* el aire,	to fly *in* the air.
Volver *por* la verdad,	to defend the truth.

Z.

Zafarse *de* alguna cosa,	to escape anything.
Zambucarse *en* alguna parte,	to hide oneself *in* any place.
Zampuzarse *en* agua,	to dive *into* water.
Zozobrar *en* la tormenta,	to founder *in* the storm.

TERMS USED IN COMMERCE.—III.

[*Continued from p.* 272.]

Prime Cost.—The first cost, before charges begin to accrue.

Principal signifies the responsible person. It also applies to the partners in any establishment, who are spoken of as the principals. In Banking, the sum on which the interest arises.

Privateer.—A private ship fitted out for warlike purposes under a licence from the Government. (See *Letters of Marque.*)

Proceeds.—The actual result or sum produced by any sale.

Proctor.—An officer in the admiralty and ecclesiastical courts, corresponding with an attorney in common law or a solicitor in equity.

Procuration.—The representative power derived under the authority of another, either by letter or power of attorney.

Produce.—The raw productions of a country; a term more frequently applied to those of foreign growth, such as tea, cotton, sugar, spices, drugs, and dyes.

Pro Formâ.—Two Latin words, signifying *for the sake of form.* It is customary for merchants and others to make up *pro formâ* invoices and account sales previous to entering into an adventure, in order that they may form correct opinions as to its probable result. These accounts are made up in the exact form that they would assume if the transaction were carried out, so that no item of charge on purchase or sale may be lost sight of—the selling prices being, of course, estimated according to the expectations of the parties.

Promissory Note.—A written promise by one person to pay another a specified sum of money at a stated date. It is subject to the same laws, and may be transferred by indorsement in the same way as a bill of exchange.

Prompt.—The term of credit or period fixed upon by contract for payment of the purchase money for produce.

Proof in Bankruptcy.—The requisite proof, by affidavit or oath, of the correctness of any claim made upon a bankrupt's estate.

Pro Ratâ.—A Latin term signifying *proportionably.*

Protest of a Bill.—A declaration made by a notary or other person of the presentation of a bill (either for acceptance or for payment), of the reply received, and of the refusal to accept or pay.

Protest (Ship's).—A declaration, made by the master and crew upon oath, of the particular circumstances under which any injury to a ship or cause of damage to her cargo has arisen.

Proxy.—Authority placed in the hands of a deputy, as a substitute for its personal exercise.

Quarantine.—A regulation in force at certain ports, cutting off and interdicting for definite periods all communication between ships and the shore, on their arrival from places commonly affected with contagious diseases.

Quid Pro Quo.—A Latin phrase, signifying *one thing for another.* The mutual consideration in contracts.

Quotations.—Stated prices. It is usual to quote the prices of certain articles, inclusive of the charges incurred in their delivery on board ship, which are termed *quotations f. o. b.* (free on board).

Rate of Exchange.—The actual price at which bills on a foreign country can be bought.

Real Property.—Property that cannot be moved, such as land, houses, etc.

Rebate.—A return of discount by bankers and others upon bills taken up by the discounter previous to their arriving at maturity.

Receipt.—An acknowledgment in writing of having received a certain sum of money from a person named.

Re-exchange.—A charge upon the drawer of a dishonoured foreign bill of exchange upon a redrawing by the holder. Whatever expense or damage is incurred in consequence of the dishonour of the bill is included under this head. The whole is, however, frequently consolidated by custom into fixed percentage rates for particular places.

Reference.—The direction given by a person requiring credit, to the trader of whom he requires it, to a third party, who may be questioned relative to his commercial standing.

Registration.—Registering ships at the Custom House so as to entitle them to the enjoyment of the privileges attending British-built vessels. A certificate of registry is granted, which states the build, tonnage, and names of the owners and master, and forms a proof of the nation to which a vessel belongs.

RE-INSURANCE.—A sub-insurance effected with others by insurers who have incurred too great a liability, or who have become dissatisfied with the nature of the risk they have contracted to take upon themselves.

RELEASE FOR FREIGHT.—A formal release given by the owners of vessels or their agents on receipt of an amount of freight, when notice has been previously given by them to the dock companies or wharfingers to stop delivery of the goods pending its payment.

REMITTANCE.—A sum of money or bills of exchange sent from one person to another.

RESERVE.—A fund set aside for the purpose of meeting any extraordinary contingencies or losses likely to arise in the course of business.

RESIDUE.—That which is left of an estate after all claims upon it have been satisfied.

REST.—In banking, the accumulated amount of profit applicable for the purposes of dividend.

RETURNS.—A term applied to any merchandise or bills of exchange purchased as a means of returning the proceeds of consignments received; also the amount of a trader's sales.

REVENUE.—Income derived from a collective source; usually applied to the annual receipts of a country from taxes, Customs duties, and other sources.

REVERSION—REVERSIONARY INTEREST.—A right to the possession of money or property at a certain future period, or after the death of another.

SALARY.—A stipulated annual or periodical payment for services.

SALVAGE is compensation allowed to persons who are instrumental in saving goods or ships from the dangers of the sea, or from fire.

SAMPLE.—A small portion obtained from the bulk of any article of merchandise to serve as a specimen of the whole.

SCHEDULE.—A sheet of paper appended to any written instrument, and containing a detailed statement or a list of the property mentioned therein.

SCIRE FACIAS.—A writ most commonly issued to call a person to show cause to the Court issuing it why the execution of judgment previously passed against him should not be made out.

SCRIP CERTIFICATE.—A certificate given in receipt for money paid for shares in public companies preliminary to the registration of subscribers; or of instalments paid towards public loans previous to the issue of the bonds.

SCRIVENER.—A negotiator of monetary transactions, acting as a middle-man between borrower and lender. Also one who is employed to draw up and engross deeds, conveyances, and securities for money.

SEARCH WARRANT.—A warrant granted by a magistrate, directing any given premises to be searched—generally for stolen goods.

SEAWORTHY.—A term indicating that a vessel is in a proper state of repair, and in every way fitted for her contemplated voyage.

SECURITIES.—Documents representing or securing a right to money or property of any kind, such as bills of exchange, warrants, deeds, bills of lading, policies of insurance, leases, and bonds.

SEISIN.—The ownership and possession of freehold property.

SEQUESTRATION.—The course by which the estates of insolvent traders and others in Scotland are realised and divided among their creditors. Equivalent to the term *Bankruptcy*.

SET-OFF.—A counter claim by the person on whom a demand is made; the sum due by one operating as payment or part payment of the sum due by the other.

SETTLEMENT.—The adjustment of an account or claim. Generally applied to the payment of accounts in full of all demands.

SHARE—SHARES.—The proportion of interest in any undertaking or company.

SHIPMENT.—A quantity of merchandise sent by a vessel to either a foreign port, or one in the same country.

SHIP'S PAPERS generally consist of the certificate of registration, manifest, muster-roll of crew, and log-book, with sometimes a charter-party and bill of health.

SHORT EXCHANGE.—Bills of exchange drawn for short payment, at sight, or three days after sight.

SIC.—A Latin word signifying "thus," or "after this fashion."

SIGHT.—Presentment of those bills of exchange whose due dates are determined by the period at which they are first seen, or sighted, by the persons on whom they are drawn.

SINE DIE.—Signifying "without fixing any day for re-assembling"; thus, "to adjourn *sine die.*"

SINKING FUND.—An accumulative fund set apart for special appropriation, such as the extinguishment of a debt.

SLEEPING OR DORMANT PARTNER.—A partner who does not assist in the management of a business, but who receives a share of the profits, and is also liable for a share of the loss.

SOLVENCY.—The state of being able to pay all debts in full. The adjective descriptive of this state is *Solvent*.

SPECIE.—Coined money of any description.

SPECIFICATION.—The distinct expression of the items or details of a matter.

SPECULATION.—An incurring of heavy risks with a view of obtaining a more than usual profit.

STANDARD.—A fixed or determined point by which certain things are adjusted, as a standard of value, quantity, or quality.

STAPLE.—The chief article or articles of a country's production and commerce.

STATISTICS.—A collection of facts relating to the condition and progress of the whole or part of a State or its commerce.

STATUS.—Used commercially to imply a man's position and condition with regard to money matters.

STERLING.—The denomination given to English money.

STOCK.—Accumulated goods or money. By dealers, goods in possession are spoken of as stock on hand. By commercial men and bankers, their amounts of capital are called stock. The term also applies to any of the various capital debts of different countries, which are termed collectively *Stocks.*

STOCK EXCHANGE.—A building where stock-brokers and jobbers meet to transact their business.

STOCK-BROKER.—See *Brokers.*

STOCK-JOBBER.—A member of the Stock Exchange, and dealer in stocks and shares, carrying on operations with other dealers and with the public through the medium of the stock-brokers.

STOPPAGE IN TRANSITU.—The right of a seller of goods to recover them while in course of transmission to the buyer or his agents, if, since their purchase, the buyer has become bankrupt or insolvent.

STRANDING.—The running of a ship on shore or on the rocks, and leaving it stationary there for any length of time.

SUBPŒNA.—A writ calling upon a person to appear at the day and place named in the writ, under a penalty.

SUPERCARGO.—See *Cargo.*

SUSPENSION OF PAYMENTS.—A trader ceasing to pay any of his debts on becoming aware of his inability duly to discharge the whole.

TACK.—See *Lease.*

TARE is a deduction for the weight of a package in which goods are secured. It is of three kinds—actual, average, and estimated. *Actual tare* is where each package is weighed separately from its contents; *average tare* is where the packages are numerous, and of a similar size and character, and a few are weighed so as to form an average for the whole; and *estimated tare* is where packages in particular branches of commerce are so invariably alike as to warrant a fixed percentage allowance for them.

TARIFF.—A table of charges. Also an enumeration of articles on which duty is levied, with the various rates charged, as well as the articles that are prohibited or exempt.

TENDER.—An offer in writing to supply certain goods, money, ships, or articles that may be required upon specified terms and conditions. Also a presentment or offer of money in satisfaction of a debt or claim.

TONNAGE.—A ship's carrying capacity. Registered tonnage and actual capacity sometimes differ considerably, owing to the build of the vessels.

TONTINE.—The system of raising money by granting life annuities to a number of persons with benefit of survivorship as the lives fall in, until at last a single survivor becomes entitled to the whole.

TRADE, BOARD OF.—A department of the Government organised to control all matters having regard to the trade of the country and to the colonies.

TRAVELLER.—A person engaged by wholesale houses and manufacturers to canvass for orders, collect money, and represent their interests away from their place of business.

TRET.—An allowance of 4 lb. on every 104 lb. on certain articles of merchandise for dust, etc.

TRINITY HOUSE.—An establishment incorporated by charter in the interests of navigation and commerce; it is empowered to erect lighthouses, appoint pilots, settle the rates of pilotage, conduct the examination of mariners, and regulate, in many respects, the marine affairs of the country.

TROVER.—An action for the recovery of personal property, or for damages.

TRUCK SYSTEM.—The system of paying the whole or part of workmen's wages in goods instead of money.

TRUSTEE.—One who is entrusted with the care or management of property or a business for the benefit of others.

ULLAGE.—The quantity deficient in casks of liquids.

UNDERWRITER.—In marine insurance, generally applied to the individual insurers at Lloyd's and elsewhere, who underwrite or subscribe their name to each policy they are concerned in.

USANCE.—The established custom or usage of different places as to the periods for which foreign bills of exchange are drawn. The following are the usances at the respective places:—

Amsterdam	1 month's date.
Antwerp	1 ,, ,,
Altona	1 ,, ,,
Augsburg	15 days after sight.
Barcelona	60 days' date.
Berlin	14 ,, sight.
Bilboa	2 months' date.

Bremen	1 month's date.
Bordeaux	30 days' ,,
Cadiz	60 ,, ,,
Danzig	14 ,, sight.
Dresden	14 ,, ,,
Frankfort-on-the-Maine	14 ,, ,,
Geneva	30 ,, date.
Genoa	3 months' ,,
Gibraltar	2 ,, sight.
Hamburg	1 ,, date.
Leghorn	3 ,, ,,
Leipzig	14 days' sight.
Lisbon	30 ,, date.
Madrid	2 months' sight.
Malta	30 days' date.
Milan	3 months' date.
Naples	3 ,, ,,
New York	60 days' ,,
Oporto	30 ,, ,,
Palermo	3 months ,,
Paris	30 days' ,,
Rio Janeiro	30 ,, ,,
Rotterdam	1 month's ,,
Sydney	30 to 90 days' sight.
Trieste	14 ,, ,,
Venice	3 months' date.
Vienna	14 days' sight.

Usury.—The legal rate of interest in England having at one time been 5 per cent., any excess upon that rate, excepting as regarded bills of exchange, was denominated usurious, and was by the then usury laws rendered illegal. These laws having been abolished, money-dealing is now entirely unrestricted in this respect.

Vendor.—The person on whose behalf a sale is effected, or who is himself the seller, is termed the *Vendor;* and the one for whom a purchase is made, or who is himself the purchaser, the *Vendee.*

Voucher.—Documentary evidence or proof in writing of the payment or receipt of money or of other transactions.

Warehousing.—A system of storing imported goods in public warehouses, on their being landed from the vessels, pending their disposal for home consumption or re-exportation.

Warrant of Attorney.—A power given by a client to his attorney to appear and plead for him, or to suffer judgment to pass against him by confessing the cause of the action to be just. Also generally applied to power given by one person to another to transact any specified form of business at the risk of the person giving such power.

Warranty.—In marine insurance, certain expressed exceptional conditions affecting the subject-matter of the policy, such as the periods of a ship's sailing, or the liability of insurers for average claims. In life assurance, the stipulation contained in the policy to the effect that the declaration as to health, etc., signed by the assured, shall become a condition of the policy.

Waste Book.—Another name in bookkeeping for the *Journal.* Under the old Italian system it was a book in which the Journal entries were collected and roughly made.

Ways and Means.—An expression implying the resources of an individual or concern applicable for certain purposes, and the mode of applying them.

Wharfage.—A charge for receiving and removing goods on the quays of the various docks or wharves, either on their shipment or landing.

Winding up.—A term applied to the closing up of any transactions or business. An Act of Parliament compels the winding up of the affairs of public companies under certain circumstances.

ENGLISH LITERATURE.—XIX.

[*Continued from p.* 322.]

DEFOE TO COWPER.

Defoe, born in London in 1663, was the son of a butcher, and became a hosier soon after leaving school. Ere he entered on this trade, however, he had already scribbled a little. He joined Monmouth's rising in 1685, thereafter speculated in one or two mercantile adventures, became bankrupt, struggled into business again as a tile manufacturer, and then obtained the post of commissioner on glass-duties. When King William came to the throne, the Jacobites called out upon him as a foreigner; but Defoe, who all through his life was a Whig partisan, defended His Majesty in a satire called "The True-born Englishman." This had a prodigious success; 80,000 copies were soon sold off in the streets. Other successful works of Defoe's are: "Moll Flanders," "A Journal of the Plague" (fictitious, but often taken for true history), "Colonel Jack," "Captain Singleton," "Memoirs of a Cavalier," and "Roxana." It was not until Defoe had lost his fortune and health, and had emerged from a prison, partially paralysed, that he began his "Robinson Crusoe." This appeared in 1719. It has been translated into every European language. Founded upon a few incidents in the life of a Scottish seaman named Alexander Selkirk, it deals with fictitious circumstances in such a minute and seemingly veracious manner, that the reader feels Robinson Crusoe as living a reality in his mind as Columbus. Defoe had a hard life, and died in London, in 1731, worn out with disease and misfortune.

"Robinson Crusoe" was Defoe's greatest work; but some of his other stories, like "Moll Flanders" and "Colonel Jack," more distinctly indicate the work he did in diverting the attention of literary men from classical and romantic subjects, and fixing them on life around them. Defoe's manner of studying life was coarse; and he could describe things and incidents better than character. Samuel Richardson, however, took up his pen, and gave us minute pictures of the manners of life in his times, with capitally executed studies of character.

Samuel Richardson was born in Derbyshire in 1689, and became a printer in London. He often exercised his pen in writing indexes, prefaces, and "honest dedications" to the volumes he printed and published; but real authorship he did not attempt until he had passed his fiftieth year. Two brother booksellers desired him to write a collection of familiar letters, for the instruction and edification of youth. Richardson pondered the task for some time, and conceived that he might possibly introduce "a new species of writing that might turn young people into a course of reading different from the pomp and parade of romance writing, and, diminishing the improbable and marvellous with which novels generally abound, might tend to promote the course of religion and virtue." So the result was that this collection of letters became the first real English novel, and appeared under the title of "Pamela, or Virtue Rewarded." These letters, passing between several people, tell us of a pretty bashful young servant girl, to whom her wealthy young master makes love in rather a free fashion. The girl's modesty prevails triumphantly in the end, and virtue is rewarded by her getting the rake to propose real marriage to her. She drives off with him to church, and goes home to make him happy ever after by helping his housekeeper "to make jellies, comfits, sweetmeats, marmalades, cordials, and to pot, candy, and preserve." It was curious that the long-drawn story of this young girl's temptation should have been selected by Richardson for the reading of youth, and still more curious that divines like Dr. Slocock should publicly praise the tendency of the book from the pulpit. Dr. Watts was more near the mark when he told the author that a young woman could not read it without blushing. The moral of the whole thing is not so high-pitched as Richardson supposed, being prudential at the best. The minutely delicate touches of human character with which the novel abounds are wonderful and fascinating, and although no sentence in the book stamps Richardson as a great thinker, the cumulative effect of what he writes amounts to the effect of true genius.

"Clarissa Harlowe," in eight volumes, was Richardson's next novel. Its execution is similar to that of "Pamela" and its morality is just as doubtful. Clarissa is less lovable than Pamela, and goes through life as if she had a treatise on propriety always in her hand. This novel contains the classic Lovelace, an accomplished, ingenious, handsome, villainous profligate. As a contrast to Lovelace, Richardson has given us his idea of an English Christian gentleman in his third novel, "The History of Sir Charles Grandison." People laugh now when they read this book; and it never succeeded so well as its predecessors. Sir Charles Grandison acts and talks like a figure that has just stepped out of a "moral waxwork."

Of course, many laughed at Richardson's namby-pambiness, even while feeling his power. Henry Fielding resolved to burlesque him. Fielding, born near Glastonbury in 1707, had been student, man of pleasure, spendthrift, playwright, lawyer, all in turn, before he brought forth his parody of "Pamela." It appeared in 1742, and was called "Joseph Andrews." He "builded better than he knew." In satirising Richardson, and aiming at burlesque, he really drew pictures of England and English people that were the most graphic ever written. His next efforts were "A Journey from this World to the Next," and "Jonathan Wild." Then came his masterpiece, "Tom Jones." In this novel he certainly takes our breath away pretty often. He is frank to a fault; he nothing extenuates, but tells us all he knows about the life of ordinary Englishmen and women of his day, who eat plenty of beef and drink plenty of ale, and love sport and horseplay, and talk in very plain speech, with jokes that would shock any of us now. Fielding, more than any other writer, has drawn John Bull. He is not particular as to the circumstances with which he surrounds his characters; but his teaching as a whole was healthy. His Tom Jones, who was meant as a sort of antidote to the priggish Sir Charles Grandison, is a sad young dog at times; but it is the very healthiness of his blood, and the heartiness of his character, that land him in such scrapes. Honesty and manliness are his backbone. After the somewhat sickly sentimentalisms of Richardson, which at the best preached negative abstention from immorality rather than spontaneous goodness and generosity, Fielding's teaching was of service. Two years after "Tom Jones" was published, Fielding received £1,000 for "Amelia," which is almost as good as "Tom Jones." The novelist's first wife was named Amelia; and this book may be said to be a tender tribute to her memory. Fielding died at Lisbon in 1754.

Fielding, whom Byron has called "the prose Homer of human nature," took large views of everything; he dealt with things in the rough, as it were. Laurence Sterne did the opposite. Any triviality that was odd sufficed him to make quite a series of chapters out of. He was a quiz of human nature; there is in him much of the melancholy sarcasm which Shakespeare puts into his "Jaques." Like Jaques, he rather prides himself on eccentric manners, and you never know what he will say next. In 1759 his first book began to appear, "The Life and Opinions of Tristram Shandy, Gent." This is scarcely a tale at all; it is a medley of half-told incidents, half-hinted criticisms upon life, and mad sport of wit after the manner of Rabelais. Some of the wit is quite shocking, and one must say of Sterne, as Keats said of Byron, that his was a talent that made solemnities out of trifles, and solemn things into trifles. Nevertheless, tenderness of a strangely delicate kind is not wanting in the work of this pruriently-minded man; "Tristram Shandy" contains one of the most beautifully and pathetically told stories in any language, the story of Lefevre. Sterne's other masterpiece is "A Sentimental Journey through France and Italy." He had been born at Clonmel in 1713, and spent the most of his life in a position which he neither suited nor adorned, that of an English country parson. Some volumes of his sermons were published. He died in 1768.

Abbotsford, from the River. (*From a Photograph by Valentine & Sons, Dundee.*)

Sterne was a wit: Tobias Smollett was a humorist Sterne smiles at us; but Smollett laughs with us Sterne sees far deeper into nature than Smollett does; yet Smollett is quite as healthy reading as the author of "Tristram Shandy." Smollett is the legitimate successor of Fielding, and will move you with real fun far more than Fielding will; but the fun, after all, is romping, noisy fun, and often enough offensive to delicacy. Tobias Smollett was born near Dumbarton, Scotland, in 1721. Like Fielding, he tried several kinds of life before becoming a novelist. Playwright, surgeon's mate, city doctor, satirist, he only found his true work in 1748, when he produced "Roderick Random" This rollicking story embodies much of his personal experiences. Smollett's other novels, all marked by strong humour, are "Peregrine Pickle," "Ferdinand Count Fathom," "Humphrey Clinker," "Sir Launcelot Greaves." Smollett executed other literary work besides, as, for instance, a translation of "Don Quixote," and a "History of England" in four volumes. This history ruined his health; he died in 1771.

Novel-writing now takes a purer strain in our literature. Oliver Goldsmith, an Irishman, born in 1728, came to London after many vagaries, and settled down as a literary man in the year 1756. He was a merry, open-hearted, reckless fellow, full of ideas, but devoid of the common sense necessary for their development. He was invited to write for the *Public Ledger*, and to the pages of this newspaper he contributed the papers now so well known as "The Citizen of the World." Dr. Johnson took him up, and introduced him to the great literary folks. "The Traveller," a fine poem, soon proved what stuff was in him. But debts lay heavily on his conscience and his imagination. One day he had to send and ask Johnson to help him out of some pecuniary difficulty. Johnson went to see him, and found he had a prose tale lying neglected in his desk. This Johnson was able to sell at once to Newbery the bookseller, for £60. It was "The Vicar of Wakefield." The idyllic, yet natural charms of this story will never die; it has proved the most popular novel in the world. Unmatched simplicity of narrative style, delicate and unobtrusive humour, variety of situation and incident, and beautiful sympathy with goodness, make this wonderful tale inexpressibly dear to all lovers of literature. There is that universality of human interest in the "Vicar of Wakefield" which appeals to readers of all ages and all nationalities. The child of nine eagerly devours it; and Goethe has recorded that it was a powerful factor in the development of his intellectual life. With the "Vicar of Wakefield" the period of the classic English novelists may be said to end. The fiction of that time had reached a perfect blossom.

John Keats. (*From a Portrait by Severn.*)

The lovely artlessness of Goldsmith's expression gave its characteristic charm to his poetry, as well as to his prose. Goldsmith's verse is to Pope's what a sweet wayside hedge is to a Dutch garden. Pope's poetry is all head-work; Goldsmith's is full of affections, sympathies, charities, extended both towards man and towards nature · it is gently emotional throughout. Goldsmith, both in his "Traveller," and in his "Deserted Village," subsequently published, exhibits far more sense of external nature than Pope and his school dreamt of. His was not an exact knowledge of nature; his sense of its beauty was expressed in a general way. But the advance his time had made in appreciation of the external universe must be noted. Goldsmith wrote two successful comedies, *The Good-natured Man* and *She Stoops to Conquer.* He died in the Temple in 1774

James Thomson, a Scotchman, author of "The Seasons," "The Castle of Indolence," and other poetical works, was a contemporary of Goldsmith's, and like him helped to bring about a better feeling for the influences of nature. Akenside, who wrote "The Pleasures of the Imagination," rather harked back on the classic style of Pope, but not very successfully. Collins distinguished himself chiefly by some graceful odes, of which that addressed to Evening is the most admired Gray wrote several volumes of good poetry, but by far the best of his productions is his very perfect "Elegy written in a Country Churchyard." The churchyard was that

Percy Bysshe Shelley. (*From the Drawing by Miss Curran.*)

of Stoke Pogis. Churchill penned a good many telling satirical poems; and William Cowper, born at Great Berkhampstead in 1731, achieved a poetical fame that will last long. His humorous ballad of "John Gilpin" is still a favourite with young and old; his "Task" contains much fine thinking and fancy; and his "Olney Hymns" express devout religious sentiment in a pure style, unhappily too rare in verse of this class. Cowper lived to the year 1800. Wesley and Watts belong also to the evangelical party of this period, while David Hume and Gibbon, the historian, wrote upon the freethinking side.

The outstanding figure among all these writers in the beginning of the eighteenth century is Dr. Samuel Johnson. Johnson was born at Lichfield in 1709, and had many a hard struggle in London before he attained any pecuniary comfort as a literary man. His chief work is his "Dictionary of the English Language," truly a gigantic task to accomplish, and accomplish so ably. The essays published under the titles of "The Rambler" and "The Idler" were well received; his tiresome "Rasselas," a tale written to pay the expenses of his mother's funeral, was still more popular for a time, although, as Macaulay has remarked, the author in his Abyssinian romance "transferred the whole domestic system of England to Egypt." A great service was done by Dr. Johnson to our literature when he published his "Lives of the Poets." These contain condensed information and criticism of a very valuable character, though, as a critic, he occasionally went curiously far astray. In writing of Johnson, we must never forget James Boswell, who has attained immortality by his biography of his patron.

THE ROMANTIC SCHOOL.

Robert Burns was born near Ayr in 1759. He worked on his father's farm when a lad, and had little to read except Mackenzie's "Man of Feeling" and a book of songs. Verses of his own began to be circulated about his home, and afterwards in the neighbourhood of Mauchline, where he settled for a time. Boon companions liked to drink with him, and hear poetry from him. His life grew disreputable in several ways. It had its gleams of triumph, however. He was fêted for a season at Edinburgh, and a collection of his poems, originally printed at Kilmarnock in 1786, went through more than one edition. But fortune never smiled serenely upon him. The staple of his income was about £70 a year, earned in the capacity of exciseman at Dumfries. Broken by the strife of a proud spirit with hard circumstances and inflammable inclinations, he wasted himself away in drink and riot, and died miserably in 1796. The world had not taken the least care of him. It was only after he had been snatched from it that it recognised what a gift of God to humanity a heart like his is. It had throbbed and thrilled itself into lyrics as purely beautiful as ever pen transcribed. He is all heart as a poet. You feel the warm blood pulsing warmly through his writings. Anyone who reads the poetry of Burns gets as near the secret sources of human emotions as can be.

Walter Scott was also a revolutionary, but only in a strictly literary way. His was a happy, sound nature that goes with steady work and strong digestion and undisturbed sleep. He did not feel himself "born to put the crooked straight"; but he was sick of the sillinesses and commonplaces that were so rife in the fashionable literature of his time, and he determined to try his hand at something better. He was the son of a lawyer practising in Edinburgh, where he was born in 1771. He was rather a dunce at school, and even at college he was nicknamed Duns Scotus. By-and-by, pinned to a desk in his father's office, he secretly regaled himself, not with deeds and statute-books, but with ballads and romances of chivalry. Scott's mind would have echoed the whimsical saying of Charles Lamb, "Hang posterity! Let me write for antiquity." His heart was in bygone ages, and he made the past a pageantry. His first novel was "Waverley" (1814). When this had taken the kingdom by storm, he went to work steadily to produce a long series of romances of the same kind. In earlier years he had also created a sensation with his romances in verse, of which the best are "The Lay of the Last Minstrel," "Marmion," and "The Lady of the Lake." George IV. made him a baronet. He had built himself a sort of baronial palace at Abbotsford, and entertained there in princely style. Then disaster came through commercial relations with Constable and Co., printers. Scott lost £150,000. At once he began the task of paying off all his creditors and retrieving his fortunes. He wrote "Woodstock" for £9,000, and a "Life of Napoleon" for £18,000. Many other labours succeeded these, and wore him out. He died at his beloved Abbotsford, with the Tweed murmuring in his ear, on the 21st of September, 1832. Sir Walter Scott is free enough in his treatment of history; he is content to extract from it romance, not bare fact. Yet to him we owe, not merely the pleasure of the ordinary novel-reader, but a sense of vivified history which duller, if more accurate, chronicles do not afford us. The historian peers into the dim past with a candle, and shows us facts in their truth. But Scott leads us into it with a many-coloured lamp, and lights it up with dazzling hues.

Scott had been tempted by popularity to stake his chances of fame on his poetical efforts. But he was wise, and recognised that a far truer poet was competing with him. That was Byron. George Gordon, Lord Byron, was born in London in 1788, and as early as the year 1807 he had acquired notoriety as a clever but selfish man of pleasure. In that year he published a volume of verse entitled "Hours of Idleness." This was ridiculed by the *Edinburgh Review*; and the article in this periodical drew from him the bitter satire, "English Bards and Scotch Reviewers." Byron soon developed to maturity all the vices of Burns, in fuller measure, and without the excuses Burns had. With Burns poetry was the life, vice the accident. It almost seems as if, for a time at least, vice was the life of Byron, and poetry the accident. In 1812 he published the first two cantos of "Childe Harold," and he records that "he awoke one morning and found himself famous." The romance that was in the air at that time now impelled him to write tales in passionate verse such as "The Giaour," "The Bride of Abydos," "The Corsair," "Lara," "The Prisoner of Chillon," "Manfred." His "Childe Harold" was likewise completed, and he startled the world with an amazingly clever licentious poem called "Don Juan," about which almost anything bad or good may be said. Byron wrote many memory-haunting lyrics; his descriptive powers were of a high order; and his dramatic talent, though irregular, was strong. His chief fault is poetic egotism; his self pervades all that he writes. Macaulay likens him to the india-rubber face in the toy-books, which thrusts itself through page after page, and puts the same head on all sorts of figures. He died in 1824 at Missolonghi, whither he had gone to give a little glory to his tarnished life by fighting for the cause of Greek independence.

We have still to notice two bands of poets in whom modern ideas were fermenting during this period. One of these bands was what was called the Cockney School of Poetry. It was for a time headed by Leigh Hunt, a poet and essayist whose reputation still lives. Perhaps his best poem is that for which he was most assailed, "Francesca da Rimini." It deals with a somewhat unpleasant theme. Hunt had all a Londoner's ways about him, and babbled of green fields in rather a second-hand style. His language was perhaps rather luscious at times, and there was a gush about his expression of emotion that critics were not accustomed to. They attacked him severely, but not so irrationally as they attacked Keats, whom they pronounced a pupil of Hunt's Cockney School.

John Keats, the son of a livery-stable keeper, was born in London in 1796, and became articled to a surgeon, and afterwards attempted to practise for himself. His real bent, however, was towards literature, and his first poem, "Endymion," appeared in 1818. The *Quarterly Review* and *Blackwood's Magazine* vilified this grand poem as maundering, meaningless trash. Keats by-and-by brought forth another volume entitled "Tales and Poems." This contained the noble fragment, "Hyperion," besides the mystically beautiful "Eve of St. Agnes," and several other rich additions to our literature. Keats was of a consumptive tendency, and went to Italy to ward off the complaint. A hopeless love, however, combined with the consumption to prey upon him, and he died at Rome in 1820. In sensuous appreciation of the beautiful, Keats is unsurpassed. Richness of phraseology gives to his pages the many-hued glory of stained glass. Beauty is everything to Keats, undeveloped as he was; he has little to teach but the joy of existing.

Percy Bysshe Shelley, born at Field Place, Sussex, in 1792, was Keats's twin brother in some characteristics. He was still more of a rebel to conventionalities nevertheless, and committed far more errors, though on the other hand he had many splendid moral qualities. His poetry has much of that impalpable beauty which cloudland has; his spirit seems to hover about the lonely peaks of human thought like the fantastic mists. His qualities are all ethereal. His verse has a pure cold Alpine beauty; but it is only rarely that it stirs the warmer human instincts. Shelley was drowned in the Gulf of Spezia, in 1822, with Keats's Poems in his pocket. His principal works are: "Queen Mab," "Alastor," "The Revolt of Islam," "The Prometheus Unbound" "The Cenci" (a drama), and "Adonais." Shelley was, like Keats, generally supposed to be a disciple of Hunt's. He was a disciple of nobody as a matter of fact.

The other band of poets was the famous Lake School, so-called because the writers who formed it dwelt more or less among the English Lakes. Coleridge, Southey, and Wordsworth were the great Lake Poets. In their youth they favoured revolutionary and socialistic notions. They hatched a grand scheme for setting up a miraculously innocent colony "on the banks of the Susquehanna." It sounded very well; but as they had scarcely a five-pound note among them at that time, they had to abandon the emigration scheme. They married instead, and two of them at least settled down into staid Conservatism. Samuel Taylor Coleridge, born in 1772, was an incessant thinker and a desultory writer. The chief poems he has left are the weird ghost ballad called "The Ancient Mariner," and "Christabel," a poem which everybody is compelled to admire, and nobody clearly understands. He was full of metaphysical and poetical power. His male intellect, wedded to the female intellect of Keats, would have produced a Shakespeare. Coleridge died in 1834.

Robert Southey, born in 1774, is not much valued now, though he was Poet Laureate, and a great man in his time. He wrote an enormous quantity of romantic verse, as well as prose. His best poems, scarcely ever read in our day, however, are "Thalaba," "Madoc," "The Curse of Kehama," and "Roderick" Southey worked himself into a state of mind bordering on idiotcy, and died in 1843.

William Wordsworth, born in 1770, changed the whole current of English poetry. He it was who first truly loved and studied external nature in its simplicity and its mystery. He is the high priest of nature. It had been the aim of Coleridge and Southey, as well as of Wordsworth, to cultivate the study of nature at first hand; but Wordsworth had the truest instincts and sympathies to guide him in that loving reverential study. He spiritualises the hills, finds, "in the meanest thing that grows thoughts that do often lie too deep for tears," and draws purification and sanctification for the human soul from communion with the spirit of the green world around us. He has his philosophy of life too, as well as of nature, and a noble philosophy it is, as anyone will remember who has read his "Intimations of Immortality from Recollections of Early Childhood." Wordsworth's most important works are: "The Excursion" (a long semi-philosophical poem), "The White Doe of Rylstone," "Yarrow Revisited," "Ecclesiastical Sketches," and "Sonnets on the River Duddon." No poet ever held a higher ideal before him than Wordsworth. We get no passion from him. As has been said, "There is no trumpet stop in his poetry." Yet, at any rate, he raises our imagination and interest to a very high and pure range of thought, and teaches us, with a very direct teaching, how we may ennoble ourselves.

Wordsworth, who, like Southey, had become Poet Laureate, died in 1850. The poets who have been mentioned in this chapter had few contemporaries who wrote first-rate prose—except their critics. The poetical spirit was completely dominant in the early part of this century. That poetical spirit, as we have seen, was characterised by political fervour, and also by a revived interest in romance. Many of the poets who then dreamt and sang of liberty lived to see their political hopes dispelled. But the romance which they opened up to us has not yet been exhausted by writers of our own time.

THE END

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